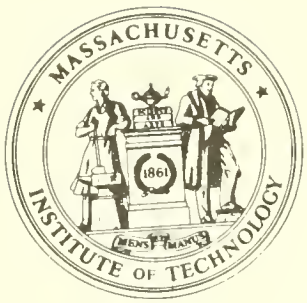

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The Management of Education

Arnold E. Amstutz

Katherine A. Moore

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Chapter 1

Introduction

"'Good teaching is not only a relatively private performance, but it resists measurement'"[1]

This book is an outgrowth of a cocktail party or, more correctly, one of the last vestiges of genteel student faculty interaction -- a sherry hour. The occasion was the final dinner honoring some one hundred students who had completed the two year Sloan School of Management Master's Program in the Spring of 1967. As the evening progressed, conversation turned from future student plans (who had been offered how much, by whom, to do what, and where) to retrospective assessment of the last four terms that students and faculty had shared.

Emboldened by the certainty of graduation, the sherry, and the man to man ambiance encouraged by the faculty members present, a few students began to comment rather specifically on perceived weaknesses in the program. As the conversation became more intensely man to man, some faculty members began to react with less than total enthusiasm and a dark cloud of mutual recrimination started to form over the increasingly noticeable group of discussants.

Just as some group members were beginning to despair at the outcome of this frank and friendly discussion, Bill Pounds, Dean of the Sloan School, entered the fray, agreed with the students that "We certainly do have some important things to learn from these experiences..." and skillfully recast the conversation in a positive vein.

It seems that no less august a body than the Sloan School Policy Committee had been considering just those issues which most concerned the

---

[1]Quoted from a recent report of the Carnegie Foundation for the Advancement of Teaching in Arthur E. Lean, And Merely Teach, Irreverent Essays on the Mythology of Education, Southern Illinois University Press, Carbondale, Illinois, 1968, page 15.

students. Their deliberations had concluded that change was required - change in the direction of "increased intra-group communication and management oriented course content"!

Later that evening Dr. Amstutz commented to Dean Pounds that it was not at all clear that the school faculty or administration possessed the goal-setting mechanisms, measurements, or organizational structure necessary to support orderly movement toward the Policy Committee's objectives. Shortly after embarking on his "as a school of management we do a less than admirable job of applying what we teach" speech, Dr. Amstutz was abruptly silenced by the suggestion that he assume the chairmanship of the Master's Program Committee to see what he and the other committee members could do to manage this portion of the Sloan School educational process.

After discussing the Policy Committee deliberations and past Master's Program Committee activities with other faculty members, Dr. Amstutz wrote Dean Pounds summarizing his conclusions that effective management of the Master's Program was dependent on overcoming three fundamental obstacles:

1. Faculty members were unable to agree on consistent and explicit objectives for the program; and progress was often stymied by faculty who refused to work toward goals they did not share or undermined programs designed to achieve results they questioned.

2. In the absence of explicit criteria and consistent measurement procedures, it was impossible to determine what actually happened in the program, much less evaluate the impact of selected pedagogical innovations or assess the extent to which specific goals had been achieved.

3. Since resources were controlled and allocated by discipline-oriented departmental groups, the Program Committee had neither fiscal nor administrative authority and depended totally on good will, persuasion, barter, intimidation, and organizational coercion to obtain the personnel and facilities required to achieve their goals.

He also suggested that these obstacles might be overcome if management of the Master's Program were approached using techniques similar to those

diligently promoted to students and non academic managers. The following excerpts from this memorandum are indicative of his thinking in August 1967.

> I would be pleased to assist in the implementation of programs proposed by the Policy Committee. However I question the validity of change oriented activity in the absence of explicit program objectives and measures, however crude, of the efficiency and effectiveness of existing and alternative educational procedures.
>
> I therefore propose that we attempt to establish:
>
> . Current faculty objectives for the Master's Program and operational definitions of desired change;
>
> . Models of educational and social processes associated with the Master's Program;
>
> . Measures of student predisposition, capability, knowledge, skill acquisition, and management performance;
>
> . Criteria for assessing the effectiveness and efficiency of alternative educational activities and classroom procedures in achieving specific educational goals.
>
> This activity will establish a basis for program management by providing the models and measures requisite to systematic planning and control. The integrating mechanism will be a process flow model of the Master's Program encompassing those aspects of the program the faculty considers significant and actionable. At the current time the following factors appear to be worthy of serious consideration.
>
> <u>The Application/Admissions Process</u>
>
> The prospective Sloan School Master's candidate receives information from the Sloan School as well as other universities offering a Master's Program in Business. He may apply to and be accepted by several other schools in addition to M.I.T.
>
> Several questions should be answered by research focusing on this application and admission process.
>
> . What are the determinants of the decisions to apply for and, if accepted, to enter a particular Master's Program?
>
> . How do students applying to M.I.T. differ from those applying to other major programs?
>
> . What are the characteristics of the entering Sloan School Master's candidate and how do these differ from candidates entering other major institutions? Can those entering the M.I.T. program be differentiated on the basis of:

- Image of or information regarding M.I.T. or the Sloan School,
- Attitudes toward real or assumed attributes of the Sloan School, and
- Career objectives?

The answers to these questions should provide a basis for communication and recruitment policies directed toward increasing application and acceptance rates from those students best qualified to benefit from and contribute to the Sloan School program.

The First Year

The first year Master's student brings a specific complement of attitudes, skills, and knowledge to the Sloan School where he interacts with other students, faculty, administration, and staff. By the end of the first year he has acquired new knowledge, skills, and attitudes. Our objective in examining student experiences during the first year should be to determine:

- The impact of prior experience, capabilities and background on performance;
- Changes in knowledge, skills, and attitudes during the first year;
- The importance of selected environmental factors in affecting noted changes;
- The efficiency and effectiveness of alternative educational approaches in producing specific changes.

The Second Year

Evaluation of the second year program should parallel the first year study with added emphasis on processes associated with career selection. This analysis might be extended to include assessment of terminal student capabilities and orientation in context of admissions and application procedures.

Since several experiments in the use of advanced technology (e.g., computer consoles and videotape equipment) are now in progress, classes employing these approaches might be compared to traditional lecture, discussion, or project courses and evaluated against previously established educational objectives.

In September 1967 the Master's Program Committee began a series of frustrating and at times divisive meetings. The intent of these sessions was to set objectives for the Program and for specific core courses and to

establish priorities and criteria for program evaluation.

The first meeting focused largely on the "problem of formulating objectives for the program in operational terms and on prospects for implementing recommendations for program change which may result from the committee's research."[1] Two tenured professors with previous Master's Program Committee experience noted that earlier committees had become "bogged down in the formulation of program objectives and made most of their progress on specific program-directed changes."

More detailed assessment of material developed by earlier program committees revealed that the basic issues of concern to the 1967 group had been considered if not "resolved" by their predecessors.

"Major issues" before the Masters Program Committee in 1964 were summarized by one of its members as follows:

> What are our goals in the Master's Program?
> Are we training future enterprise managers, consultants, candidates for the doctoral program, or some unknown quantity? Consensus on this question has been most difficult to achieve because we differ in how one defines "enterprise manager"; we differ in our conception of what such a person should know to be effective in his role; we differ in our philosophy of how best to teach whatever it is he should know; we differ in our own clarity of vision on all of the above questions; and we differ on whether it is important or not to achieve consensus on any of these basic questions.
>
> What are the dimensions of the Sloan School Masters Program which we consider legitimate to change?
> In other words, what parts of the system should we analyze as a legitimate part of our mission? Several such dimensions or parts of the system can be identified:

---

[1] Minutes of the September 18, 1967 Masters Program Committee Meeting.

1. The number of required courses
2. The content of the various courses taught
3. The structure of the curriculum in the sense of balance between required and elective courses, when they have to be taken, how many at a time, etc.
4. The method by which courses are taught
5. Faculty attitudes toward the teaching process
6. The reward structure of the Sloan School in regard to relative importance of teaching
7. The image of the Sloan School in regard to relative importance of teaching
8. The student input in terms of the kind of applications we stimulate and the admissions criteria we use
9. The teacher training system in the sense of feedback loops to faculty about their teaching
10. The new faculty input

Who and what are we, at the present time?
What is our current philosophy? What sort of a faculty are we? What are our assumptions about teaching and learning, and about content of the curriculum? Do we see ourselves as scientists, researchers, practitioners, or what?

One year later, three members of the 1965 Committee provided the following "nutshell assessment of what's wrong with the program now":

General
We perceive that the master's students are imbued with less entrepreneurial spirit than is desirable. Also we sense that the program is too scholarly in content; that symptomatic of this, too many students wish to continue for a Ph.D. rather than going out and doing something immediately. Our program is too much of a junior Ph.D. program.

All of these facets reflect a conflict between appropriate (terminal) master's degree education and our own research interests (and probably the reward process which guides it). Our research calls for interest in those things which are "far out"; the obligation to the master's student is to present material which is "far in".

Assuming that this conflict exists, our basic view is that the master's program is too large relative to the Ph.D. program.

As to the Input
First, we feel that insufficient attention is paid to the non-academic aptitudes of prospective students. Students are admitted who have almost no potential for becoming effective operators by virtue of narrowness of interests, gross personality defects, or general lack of savoir faire.

> Second, we feel that the very high geographical concentration of students (over 80 percent of domestic students from Northeastern schools) is poor in that it may lead to solidification of highly provincial ideas.
>
> As to Curriculum and Course Content
> We agree ... that there are too many required courses". Furthermore, there is, as the curriculum stands now, too little "brass tacks", i.e., management problems material in the first year. A negative way of stating this is that there is too much material in the first year which is peripheral to management, with the net result that the student is "overtooled", "overliberalized" and undermotivated to management. More specifically, there is too much pure math and too much "environmental" material.

During 1966 the Committee's attention was focused on several related issues which two of its members summarized:

> (There is) no reason why we cannot give the student a minimum exposure to the entire range of disciplinary material in one year. Further, our knowledge of absolute business needs is too flimsy to insist that he should know more than that minimum.
>
> One reason we think we need as much as we do is because of inefficiency and overlap due to present autonomy and past historical accident. It is stodgy of us to believe (insist) that things cannot be made more efficient.
>
> Another may be our slack adherence to present admissions requirements (re: economics and math)or we may want to review minimal admisisons prerequisites.
>
> Repeat: Some continuing mechanism for supervision is necessary. It cannot be done once and for all.

These Master's Program Committee discussions took place at a time when other programs and the entire university were questioning the meaning and implications of the M.I.T. experience. The following comments regarding a study of the Class of 1965 made by Dr. Benson R. Snyder in 1967 are indicative of this concern.[1]

---

[1] A talk presented to the faculty of the Massachusetts Institute of Technology by Benson R. Snyder, Wednesday, November 15, 1967.

These students [the Class of 1965] come to us at a time when higher education in America is faced with a major crisis. The rate of change between the generations has accelerated. Many of the skills, the ideas, and even the institutional structures of the preceding generation may be useless or inept for today or for tomorrow's generation.

One way we can summarize our findings is to say that the M.I.T. education, for some students, extends their capacity to adapt to a range of stimuli, while for others this same environment locks the student into the mastery of one narrow skill. The most challenging and serious general finding from our work speaks directly to this issue. In the process of achieving mastery over our specific educational tasks here at M.I.T., which for many students is getting A's, some of our students' cognitive and adaptive styles become so fixed--so locked--that their ability to cope with altered circumstances in the future appears to be seriously compromised. At the very least, severe restriction in their ability to adapt to new and different tasks may be a price that is paid for an immediate success in education at M.I.T.

When the student is seen only as he sits in class, his faculty, understandably, is not in a position to see where the student has been, or where he is going. This is a descriptive statement about the majority of encounters between faculty and students. There are, obviously, exceptions. However, it is important for you to hear again that the overwhelming perception of the students is that their faculty simply do not know them and that there is no time to know them. I am not urging that we increase the amount of time but be concerned with the quality of time spent with them.

Our effort has always been to place the various pieces of evidence about our students against the background of the institution as a whole. How many students moved out of or into a given course? When did the movement occur? What were the academic, social or emotional characteristics of these students? When did they come to the helping services, if they came? And so on. A Psychological Inventory Test was given to substantially the entire class upon entrance, to slightly fewer than half of this same class as seniors. The approach that we chose was derived from the study of ecology. We saw a number of things that we could not understand and had not expected. We found that unravelling the reasons for a given phenomenon is often slow, sometimes uncertain, and an always exciting process.

Using the ecological and epidemiological approach we inferred the incidence and prevalence of strain in the student population. This data served as the further basis for inference about the occasion, the nature, and the intensity of stress on students taking various paths through the institution, and we were able to locate the time and place of some of the more salient stresses.

This put us in a position to consider how the student responded to these stresses and how it affected his passage through the Institute. We found that one group, a substantial number of students, opens up to the range of choices and become responsive to a wider scope of intellectual and emotional experiences, as well as educational experiences. The stress for this group was not crippling.

Another large group of students tended to close down the range of experiences to which they could respond. Their response to the stress was to accentuate one or two specific adaptive positions, such as putting on intellectual or emotional blinders and denying much of the dissonance around them.

Students with different psychological characteristics have different academic fates. This can be illustrated by considering the relationship between two groups of students chosen by psychological criteria. Academic failure or withdrawal from M.I.T. in each group was determined. The first group showed a desire to seek out new, complex social and cognitive experiences. We concluded that these students would enjoy playing with ideas. This group was contrasted with another group: well-ordered, careful, they appeared to take very few intellectual risks, and they avoided ambiguity when they could. The proportion of disqualified students and students who withdrew among the students who were seeking new and complex experience is more than three times as high as the proportion of students who either disqualified or withdrew from M.I.T. among the well ordered and careful non-risk takers.

When a similar comparison was made when we looked at grades, rather than at failure or withdrawal, we found that the students who relied heavily on set schedules, orderliness, and conventionality in attitude, had a significantly higher first term rating and final cumulative rating after four years at M.I.T. There was no difference in the scholastic aptitude on math between these two groups.

The conditions, opportunities, the talents and knowledge here at M.I.T. are indeed unique. Most important, we are not caught up in a tradition but we are open to change, we are, in general, a risk-taking institution. That the colleges and universities may be becoming increasingly irrelevant for the training of the youth of today for tomorrow stands for us as a challenging thought and not as occasion for despair.

During the 1967-68 academic year the Master's Program Committee continued to grope with three basic problems:

(1) Describing and evaluating student characteristics at the time of admission, experiences within the Sloan School, and performance upon graduation;

(2) Establishing an effective administrative structure to support program implementation and coordination; and

(3) Selecting and motivating faculty with desired capabilities, experience, and interests.

Student related characteristics and processes were discussed in terms of "knowledge acquisition; development of frameworks for analysis and synthesis; examination of attitudes; recognition of the limits of one's own training; acceptance of responsibility; willingness to exercise authority; experience and involvement in a learning environment; and acquisition of skills such as problem finding, analysis, problem solving, communications and inducing change." [1]

Considerations of program administration focused on "integration of functional areas, departmental autonomy versus program effectiveness, communication of program and course objectives, reward structures to motivate goal achievement, and the availability and allocation of resources."

Discussions of desired faculty traits involved speculation about appropriate"attitudes toward management, education and research; ... capabilities required within functional groups and the program faculty as a whole; ... breadth in coverage of disciplines and educational approaches offering the student significant alternatives; ... experimentation -- investigation and evaluation of new teaching techniques and approaches; ... communication -- interaction with others in the program with regard to objectives, approaches and content." [1]

[1]Excerpted from Master's Program Committee minutes for 1967-68 academic year.

By late October the Committee had begun to assess courses within the Masters Program using "measures" suggested by instructors. Information entering these evaluative discussions included instructor supplied:

- Weighted lists of course evaluation criteria elicited by asking for "the factors that you would use in evaluating this course."
- Specification of the emphasis given "particular topics" in the course.
- Descriptions of course organization and approach in terms of the relative emphasis given lecture, recitation, seminar, individual projects, group projects, group discussion, individual or group laboratory projects, individual or group field research, and individual or group interaction with instructor.
- Expectations regarding the types of change in student skill, knowledge, and/or attitudes resulting from the course.
- Grading criteria used to evaluate student performance in the course.
- Expectations regarding the nature and extent of interaction with students in the course.
- Predisposition regarding characteristics of "the ideal student" in the course.

In December 1967 the Committee summarized their perceptions of current program effectiveness and objectives for selected courses in three relatively crude sets of "learning outcome" dimensions relating to knowledge, attitude and skill acquisition. Objectives for a new core curriculum were formulated using these dimensions and in January 1968 the first of a series of proposed changes were announced.

At the conclusion of the first term in February 1968, all instructors teaching courses associated with the Master's Program were asked to "describe how you evaluate student performance in your subject. What measures do you use and what is the relative weight assigned to each measure?" Instructors

also provided copies of the course syllabus and examinations, project assignments, and other devices used to evaluate performance in their subject. In addition, instructors were asked to describe the emphasis given various types of activities (e.g., lecture, recitation, individual projects, etc.) and the amount of change perceived in the average student in the course measured along the learning outcome dimensions developed by the committee.

Information provided by the instructors and parallel measures of student perceptions were maintained in a basic information system which was used to provide feedback to faculty and students beginning in the spring of 1968.

By April 1968 the Master's Program Committee had reached basic agreement on a rough model structure that had been reviewed with the Sloan School faculty and the Master's Program student body. While faculty members differed markedly in the importance they attached to various portions of the model, they generally conceded that it was conceptually sound and operationally acceptable "providing it isn't taken too literally."

Using the model as a framework, the Committee identified a limited number of measurement points and began to experiment with alternative measures of: faculty objectives; student characteristics including demographics, knowledge, skills, attitudes and expectations; and student and faculty perceptions of changes attributable to specific Master's Program courses.

The model formulation and testing, data collection and processing, and information system development required to structure, analyze and report the information required by the Committee became the task of a Master's Program Research Group. This body emerged in the summer of 1967 when

Professors Arnold Amstutz, Mason Haire, Irwin Rubin, Edgar Schein and Leon White along with Dr. Benson Snyder met to discuss alternative models and measures of the academic process.

In April 1968 the Sloan School approached the Ford and Carnegie Foundations with a proposal to refine the models and measurement procedures then in use at the Sloan School and to expand the existing project to encompass other programs and institutions. Funding provided by these foundations supported data gathering in a cross section of undergraduate and graduate environments as well as validation, refinement and expansion of the Sloan School model.

When this project was begun none of the research group anticipated the tumultuous conditions that it would encounter. The ethical challenges of the 60's and early 70's created some of the greatest strains experienced by the American university system since its inception. The war in Vietnam, race, drugs and student power suddenly disrupted the tranquil traditions of unprepared and somewhat bewildered college administrators. While we were contemplating measures of classroom effectiveness, they were struggling for survival.

During the four years when this research was conducted SDS became a household word; student, faculty, and "liberationists" groups vied daily for the number one spot on the Huntley-Brinkley Report; and college administrators spent the majority of their time attempting to avoid "confrontations" and deliberating whether or how to call in the police if these attempts failed.

It was in 1967, a few short months after the sherry hour noted at the beginning of this chapter that a band of militant Blacks "liberated" the campus newspaper offices at San Francisco State. When those responsible were suspended their SDS supporters registered their dissatisfaction by destroying a major portion of the administration building's contents.

At M.I.T. Vietnam Teach-in's mirrored the growing national campus concern over U.S. involvement in Southeast Asia. The following headlines from The Tech, M.I.T.'s campus newspaper, reflect the mood on campus during the outset of the research project:

"Vietnam Teach-in" (2-14-67)
"Dow Chemical Picketed at Placement Interviews" (2-24-67)
"Institute Groups will Participate in Nationwide Viet Protest Week" (3-10-67)
"Political-Academic Relationships Creates Split Within M.I.T. Faculty" (3-17-67)
"The Right to Sit" (i.e., the right for student representatives to sit on educational committees) (3-17-67)
"Students Using Marijuana Face Stiff Legal Penalties" (4-7-67)
"M.I.T. Condemned as War Machine" (4-14-67)
"Is the Trip (LSD) Worth It?" (4-28-67)
"SDS Supporters to Condemn Draft" (5-2-67)
"Speaker from Watts" (5-16-67)
"Panel Splits on Birth Control Issue" (5-16-67)
"In Loco Parentis and Coeds" (5-16-67)

While the Master's Program Committee was considering educational process, John Summerskill, San Francisco State's President, closed down his college under pressure from the Black student union, the third world liberation front and the SDS.

The Tech's September 20, 1968 headline "Violence Flares at Convention as Law and Order Prevails" reminds us of student involvement in the events surrounding the McCarthy campaign and the Democratic Convention debacle in Chicago in the summer of 1968.

During the Fall of 1968 while we were expanding our research to focus on the educational process at other institutions, the Black Panthers at San Francisco State were proposing to modify the educational process at their institution by having all "concerned" students bring guns to class to insure "maintenance of high academic standards".

While San Francisco State is a convenient reference because of the parallel timing of events on that campus and the work of this project, the problems faced there were by no means unique. Take the issue of whether or how to call in the police. The following excerpt from an article appearing in the May 4, 1969 New York Times attests to the universal applicability of this problem in the spring of that year.

> Call in the police? You are damned if you do and damned if you don't and how to balance the damnations is furrowing the brow of every academic administrator in this country, indeed in the world.
>
> The damnation from the right is loud and clear. If you let a small minority of young Hitlerian storm troopers seize your property and disrupt your institution, you are an abject appeaser guilty of bowing down to mob violence and encouraging more such violence.
>
> The damnation from the left is just as loud and clear. If you call in the cops, you are violating the fundamental right of dissent and protest; police brutality is inevitable, the brutality will irreparably split the place apart and ruin it and everything will be your fascist fault.
>
> Small wonder that there are some 50 vacant college presidencies going begging? [1]

The broader implications of increasing public antagonism toward militant students and ineffectual administrators were summarized in the May 19, 1969 issue of U.S. News and World Report in their lead

---

[1] Francis T. P. Plimpton, "The Police Must Be Called if Other Legal Measures Fail", New York Times, May 4, 1969, page 135.

story of that issue under the heading:

> As Turmoil Spreads -- Uneasy U.S. Takes Stock. Now the nation at large is finding itself embroiled in the growing struggle for control of the campus. Developing is a 'crisis of confidence' in the educational leadership -- and some doubts about the state of today's America.

> Representative Neal Smith (Dem.) of Iowa, warned educators that taxpayer disgust with "the lack of backbone of many college administrators" could deal a serious blow to the federal aid program.
>
> Attorney General John N. Mitchell has promised prosecution of "violence prone" militants on campus under the Civil Rights Acts. This earned Mr. Mitchell the displeasure of the American Assoication of University Professors, who accused him of posing "a direct threat to academic freedom and autonomy."
>
> Being asked increasingly is whether the most serious threat to academic freedom is to be found in the indecision and stalemate among educators.
>
> An analysis of Columbia University's turmoil, published recently in the British magazine "Encounter" attributed that turmoil to a "vacuum of leadership, a failure of nerve." It concluded that "Those who run the universities - and they are not the trustees or the administration, but the faculty - have quietly decided that in the foreseeable future the university is no longer a place where truth may be pursued."
>
> If professors lose their academic freedom, some observers say, it will be because of their reluctance to curb student violence. Many faculty members admit they condoned campus disorders because they sympathized with the rebels' aim - an end to the war in Vietnam, instant racial equality, and defeat for Lyndon B. Johnson and other "nonintellectuals".[1]

At M.I.T. the issues of academic relevance, the draft, drugs, and "racist" educational programs had trouble competing with a third and larger issue, Defense Department sponsored research. (M.I.T., called by some Military Industrial Tool, had some $120 million per year in military research contracts, ranking Number One among

---

[1] U.S. News and World Report, Vol. LXVI, No. 20, May 19, 1969, p.33.

university suppliers of defense oriented research and development.) Normal academic administration at the Sloan School of Management came to a halt during the spring of 1969 while the School's dean chaired a panel of students, faculty, alumni and trustees, charged with evaluating the role of classified research on the M.I.T. campus.

Without question the reactions to Kent State and the Cambodian invasion had the most dramatic impact on our research effort. The resulting student strike paralyzed questionnaire distribution and collection during the Spring of 1970.

These events are reviewed to remind the reader of the sense of frustration and turmoil prevading college campuses during the period encompassed by this research. While the campus atmosphere today may be tense, it has changed dramatically since 1968 as indicated by the following U.S. News and World Report summary of the situation in June of 1972.

> A high tide of change is rolling across American college campuses, sweeping away many old issues and leaving students in a fresh mood.
>
> Student attitudes that took shape during the academic year of 1971-72 are expected by educators to carry over to the new school year beginning next autumn. A rash of antiwar demonstrations this spring, in the opinion of many university officials, was only a temporary interruption of the course on which students are now moving.
>
> This new course appears to be away from confrontation and violence and toward some kind of working arrangement with the world outside college walls.
>
> Students seem to be reassessing the value of universities and their traditions, and finding them not so bad, after all. June commencement exercises, often marred by demonstrations in recent years, went off almost without incident.

> Some observers describe the new student mood as "apathetic'. Others call it "a mellowing". But both descriptions are challenged by those who warn against oversimplification.
>
> The campus scene is still kaleidoscopic, these challengers say, and it is impossible to put the whole picture in one frame.
>
> Authorities agree the change now evident is more than a switch from "war" to peace on campus. Among today's undergraduates there is renewed interest in politics, religion, and community service.
>
> Student goals are shifting, too, resulting in revised courses of study. Living conditions are different, and a relaxed code of personal conduct is in vogue.[1]

The activities that grew out of that June 1967 sherry hour were a strange combination of administrative expediency, political necessity, technological opportunity, and accident of circumstance. Throughout the four years encompassed by this project, research and administration have been inextricably entwined. Managerial needs for data to support program planning and evaluation forced relatively untested instruments into the field. Research desires for a broad based and generalizable model precluded the development and use of the detailed measures required to thoroughly evaluate specific courses and program segments. Managerial requirements for action motivated application of somewhat crude but useble measures, rather than development of more perfect research tools. Research demands for a sample representing a cross section of undergraduate and graduate institutions precluded concentrated analysis of schools where the educational process closely paralleled that found at the Sloan School of Management.

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[1] U.S. News and World Report, June 19, 1972, p. 28.

In final analysis, the majority of the management problems facing the Sloan School Master's Program in 1967 remain, and many of the issues raised by the Management of Education Research project are still unresolved. However, significant progress has been made on both management and research fronts. It is our hope that the following chapters summarizing these efforts will contribute to both the understanding and the management of education.

Chapter 2

Research Design

"The white rabbit put on his spectacles
'Where shall I begin, please your Majesty?'
he asked.

'Begin at the beginning,' the King said
very gravely. 'And go on til you come to
the end: then stop.'"[1]

In preparing this monograph, we will attempt to trace the development of concepts and findings through the several years encompassed by this research effort. We recognize that this procedure precludes initial presentation of neatly packaged conclusions followed by carefully expurgated summaries of the research process leading to the conclusions.

Our research process was not perfectly organized. At times we were completely unable to predict what the next computer run might show. Rather than restructure our experiences in an antiseptic textbook presentation complete with strawman null hypotheses and pre-proven theories, we will trace our at times erratic and rocky path through model formulation, measurement development, data acquisition, data reduction and structuring, analysis, evaluation, and application. We hope that this presentation will enable you to follow our reasoning (or lack of same) and to make your own judgments regarding the validity

---

[1] Lewis Carroll, Alice in Wonderland, "Alice's Evidence".

of our analytic procedures and the reasonableness of our conclusions.

A Framework for Analysis

Chapter 3 sets the stage for the study by describing our efforts to develop a model of the educational process which could serve as a framework for analyzing decisions controlling major transition points in the educational process.

After reviewing alternative views of the educational system, we will trace the steps we followed in establishing a focus for the study and boundaries limiting our representation of the educational system to a limited number of elements and processes. The major results of this effort are summarized in four flowcharts illustrating the major processes with which this study is concerned.

The Measurement Process

Chapter 4 is concerned with the design of measures that could be used to validate or correct our understanding of the educational process. Our managerial interest is to develop measures that will provide the information required for more rational, effective and efficient policy formulation and decision-making. The most important measurement points therefore involve either decisions and responses of prospective and actual students or major interactions through which academic program resources are made available to program participants.

In Chapter 4 we will identify seven measurement points in the graduate entrance process and nine measurement points associated with the graduate education process. The major portion of this chapter is devoted to a discussion of issues and conditions influencing our choice of measures and measurement procedures.

Measures associated with the entrance process include (1) the content of institutional communication (2) the qualities and qualifications of prospective program applicants (3) the attributes of applicants to a particular program (4) the information available to and used by those responsible for the admission process (5) the characteristics of students accepted and rejected by the admissions process (6) the distinguishing features of those accepted for a program who attend or decline and (7) the attributes of students entering the program.

The nine measurement points identified in the graduate education process are: (1) entering student's attributes (2) the impact of orientation (3) formulation of program objectives (4) the course development process (5) educational interactions (6) attributes of program participants at interim points in the education process (7) characteristics of those graduating from the program (8) the impact of measurement procedures used to obtain information about the program

and (9) the evaluation (faculty feedback) program through which the results of specific courses and the program as a whole are evaluated.

The material covered in Chapter 4 is summarized in a table linking the managerial objectives of the project to the measures developed to assess activity at each point in the educational process.

The Data Base and Data Structures

Chapter 5 is concerned with the practical problems encountered when the model structure and measurement procedures, described in Chapters 3 and 4, are applied in the "real world." This chapter summarizes the steps taken and difficulties encountered when contacting and obtaining data from respondents at universities selected for inclusion in this study. It also describes the data analysis and data reduction techniques as well as the statistical methods used to develop the information presented in later chapters.

The chapter begins with a review of the selection process through which undergraduate and graduate schools were chosen for inclusion in the sample. Distribution procedures used to select student and faculty participants for the study and factors affecting response rates are also discussed.

The information system used to organize and relate responses from students and faculty at each school is described in

broad overview to provide a general "feel" for the data file structures and information retrieval frameworks through which data were accessed and combined.

The third major section of this chapter examines the issues affecting the logical organization of data and the statistical techniques used to evaluate questionnaire subsets. Since much of the analysis presented in later chapters involves factor scored data, the basic rationale surrounding factor analysis is described and the resulting interpretation of factors from our application of factor analysis presented so that the reader will feel comfortable in working with these data.

The concepts on which discriminant analysis is based are also examined in this chapter. As in the case of factor analysis, the approach to this subject is conceptual rather than technical.

Undergraduate Data Analysis

Although the primary concern of this study is the management of graduate education, data from the undergraduate environment will be used to establish the attributes, expectations, opinions and perceptions of potential applicants to graduate management programs.

Chapter 6 explores the undergraduate experience by examining the characteristics of students attending seven undergraduate institutions (Boston College, Brandeis University, Dartmouth, Muskingum College, Northeastern University, Southern Methodist University, and Wellesley College). In the course of this analysis, we will be concerned with the nature of similarities and differences among students attending these institutions as well as common and diverse characteristics associated with subgroups within each institution (e.g. men and women, upper and underclassmen, and those with various career orientations).

The Graduate Admissions Process

Our examination of the undergraduate environment should provide some indication of the attitudes and expectations which influence the formulation of career objectives and cause students to apply to graduate management programs. Chapter 7 picks up the process at the point where students from the undergraduate environment apply for admission to particular graduate schools.

Our discussion of the graduate admissions process will focus on three major questions:

(1) What are the similarities and differences among applicants to various types of graduate management programs?

(2) What is the nature and effect of admissions procedures used to select among applicants?

(3) What factors determine whether a prospective graduate student will attend a program once his application is accepted by an institution?

Our analysis of alternative admissions procedures will be based on data from the M.I.T. Sloan School Master's Program. Comparative assessment of the results of admissions procedures at different types of graduate schools will be based on data from Stanford University, Southern Methodist University, Amos Tuck (Dartmouth College), and Boston College as well as the M.I.T. Sloan School.

Characteristics of Those Entering Graduate Management Programs

Chapter 8 follows those who are accepted by one of the five graduate schools included in this research as they enter their first year of graduate study. The first objective is to identify similarities and differences in the demographics, self perceptions, expectations, and personal opinions of those entering each program. We will also be concerned with characteristics of the management programs at the institutions studied and the similarities and differences among faculty members associated with each program.

Measurement of Change

Material developed in Chapter 8 provides a reference point identifying the characteristics of students entering each of the five graduate programs. Once this base has been

established, we will turn to the problem of detecting and measuring the changes resulting from the educational experiences afforded participants in each program.

Chapter 9 surveys activities within each school and the changes perceived by students and faculty members participating in the on-going educational process. This analysis will determine the levels at which significant student related change can be measured and will begin to consider the nature and relevance of such changes.

Our first objective will be to demonstrate that change can be measured over a single academic year in both the undergraduate and graduate environments. Once we have verified that this type of "net program change" can be evaluated, we will move to the measurement of course specific change during a single term and the evaluation of the learning process occurring within a single course at various points within a term.

Course Classification

Using concepts developed in the change measurement chapter, we will investigate whether particular types of change can be attributed to specific parts of the educational experience. This evaluation (Chapter 10) will focus on interactions among students, faculty, course content and methodology in individual subjects.

Our analysis will concentrate on the backgrounds, objectives and expectations of students entering the classroom interaction process as well as the intentions and objectives of the faculty members responsible for each course. Developments in the classroom will be assessed through the eyes of both student and faculty participants.

The goal of this study will be to define a limited number of different learning process types into which other classroom based student-faculty interactions will classify. The choice among research procedures and alternative bases for classification will involve us in several managerial issues as well as some minor technical problems.

Within Group Change Measurement

Once we have a basis for classifying courses into a relatively small number of categories, we will observe the educational process occurring within each classification to determine the nature of and basis for similarities and differences in these learning processes.

The analysis in Chapter 11 will encompass a broad range of factors including the expectations, experiences and capabilities with which students enter the classroom interaction, the material presented, the mode of presentation, the classroom environment, and the perceived personality traits of the professor with whom students interact. It is designed to yield

an understanding of student reaction patterns occurring within each course type and to isolate and explain the basis for different learning experiences.

Prediction of Change

Once the nature of the learning processes associated with the basic course types has been identified, we will attempt to predict in Chapter 12 the change that particular students will experience when exposed to specific course types.

While attempting to identify the causes of observed differences, we will examine student demographics, educational and career objectives, self perceptions and attitudes to determine whether any of these factors predict the learning outcomes that occur when the student enters a particular type of course.

Policy Implications

The final section of this book steps back from the detail of analysis to reconsider the managerial issues that originally motivated this research and determined the structure and measures used in the study.

Chapter 13 identifies policy implications derived from our research findings. Topics considered include admission and promotion policy, potential sources of student disillusionment, formulation of program objectives, course development and program evaluation.

Operating Implications

In Chapter 14 we will turn to operating issues faced by the program manager charged with implementing policies of the type discussed in Chapter 13. Our discussion in this final chapter is based largely on our experiences in the Sloan School Master's Program Committee. It covers a broad range of operating issues including resource allocation, organization, course management, planning and budgeting, fiscal control, faculty selection, admission processes, orientation, program evaluation and organizational obstructions and tactics for change.

We are not ready to follow the King's advice to the white rabbit. We shall "Begin at the beginning and go on til...(we)...come to the end: then stop."[1]

[1] Ibid.

Chapter 3

A Framework For Analysis

> "Order and Simplification are the first steps toward the mastery of a subject -- the actual enemy is the unknown."[1]

University education in the United States involves a system of immense scope and complexity. It is clearly unrealistic to attempt to examine all of this system. However it should be possible to investigate a limited, but significant and hopefully representative, portion of it.

This chapter sets the stage for such a study by identifying the parts of the total system that will be examined. The segments of the educational process to be analyzed are identified and the reasoning underlying their selection is reviewed.

The relationships with which this study is concerned are summarized graphically in four "macro process flow charts". These flow charts provide a framework for later analyses of decisions controlling major transition points in the educational process. The flow charts also suggest behavioral constructs that may be used to describe the attributes and behavior of major population groups.

Alternative Views of the Educational System

The idea of viewing the educational environment as a system is not new. Numerous structures have been proposed and while it is not our intent to provide an exhaustive review of the literature it is instructive to note the general characteristics of representative system frameworks proposed by others.

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[1] Thomas Mann, The Magic Mountain, Chapter 5.

A System Perspective

The advantages generally attributed to a "system" based view of the educational program are indicated in the following comments by Paul Gordon at the dedication of the new Trinity College Business School facilities in May 1967.[1]

> Proposing objectives for an education program or any other venture can be a very heady and very useless undertaking unless one is willing to take on the more controversial, demanding, and risky task of proposing how several are to be related and in what priority, in what sequence, and by what method. Though some of these questions can never effectively be resolved without appropriate and local accommodations, it may be useful to devise a tentative framework that will provide guidance in implementing objectives and built-in flexibilities for modifying boundaries and looking at the subject in different ways. Figure 3.1, page 3-3 illustrates a tentative framework to incorporate in crude fashion the idea of open and closed systems and the possibility of looking at and comparing quite varied kinds of organizations.
>
> Open System Inputs
>
> The environment category (Figure 3.1) immediately departs from some of the more traditionally and more internally preoccupied materials on administration. The concern is not only to study the economic, political, technological, social, and marketing variations at different times in differing environments but to relate these to the study of complex organizations and their administration.
>
> The resources category is an old one among economists and others, yet one of renewed interest in terms of investment, income, development, and humane urgencies about the world and in terms of relationships with which organizations and their administrators must be concerned.
>
> Closed System Inputs
>
> The information category here represents feedback from operations without the introduction of new information about environment and resources. Since the ways of processing raw data on operations and relating them to the activities of the enterprise are better established, there is a somewhat conventional though in no way a necessary, division between outside and inside (open and closed) categories.

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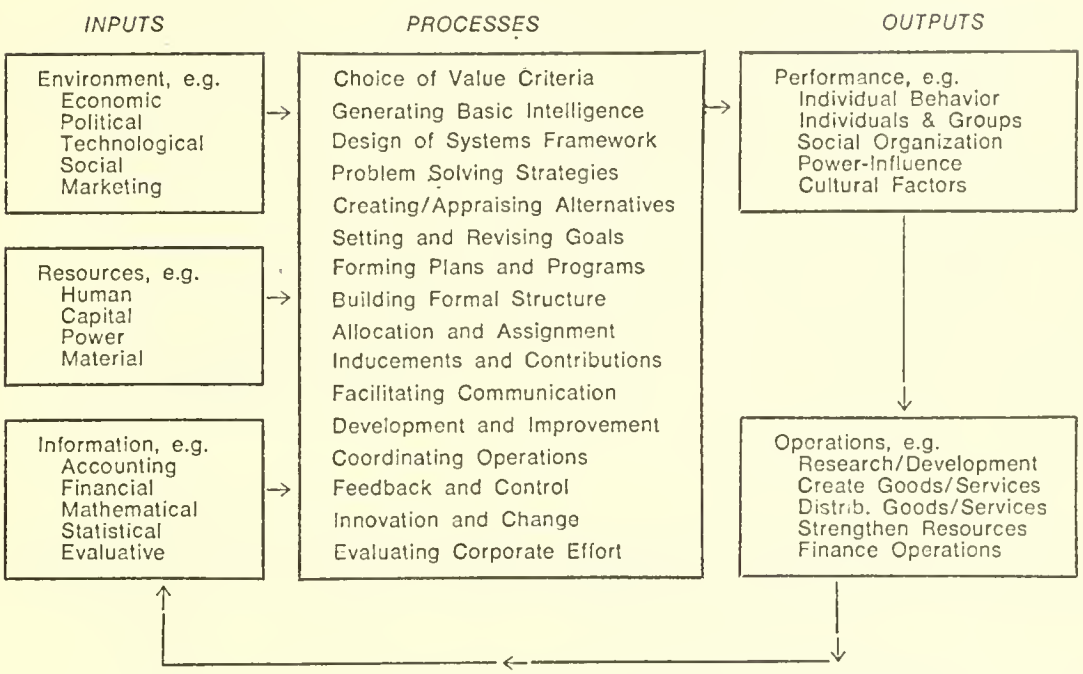
[1]Gordon, Paul S., "Administrative Strategy in a Graduate School of Administration," Academy of Management Journal, December, 1967, pp. 360-362.

Figure 3.1 A Preliminary Systems Model For An Enterprise Proposed by Paul Gordon



*As suggested in the accompanying text, inputs and outputs and their relationships can be varied; the semantics can be altered for different enterprises; the organizational "boundaries" may encompass all, more, or less than the above; and the real interaction cannot be pictured in a two dimensional diagram.

The operations category is to encompass the most basic activities that the organization has been established to perform. Subdivision will, of course, vary in nature and designation with the purpose and type of effort in question. In common and increasingly, however, most organizations of sufficient complexity to warrant this discussion will have to see to strengthening the research and development base for future operations, creating goods and/or services or both, distributing goods and/or services or both, strengthening human and capital resources currently and for the future, and financing these and other activities with attention to costs, benefits, return-on-investment, and appropriate plans for achieving and distributing any loss or surplus.

The performance category set forth is related more to behavior within organizations in contrast to behavior of organizations, which is no less important and not intended to be absent in contemplating the possible utilities of this diagram. This is simply to comment on meaning in this part of this diagram in contrast to fuller coverage earlier.

Processes of Administration

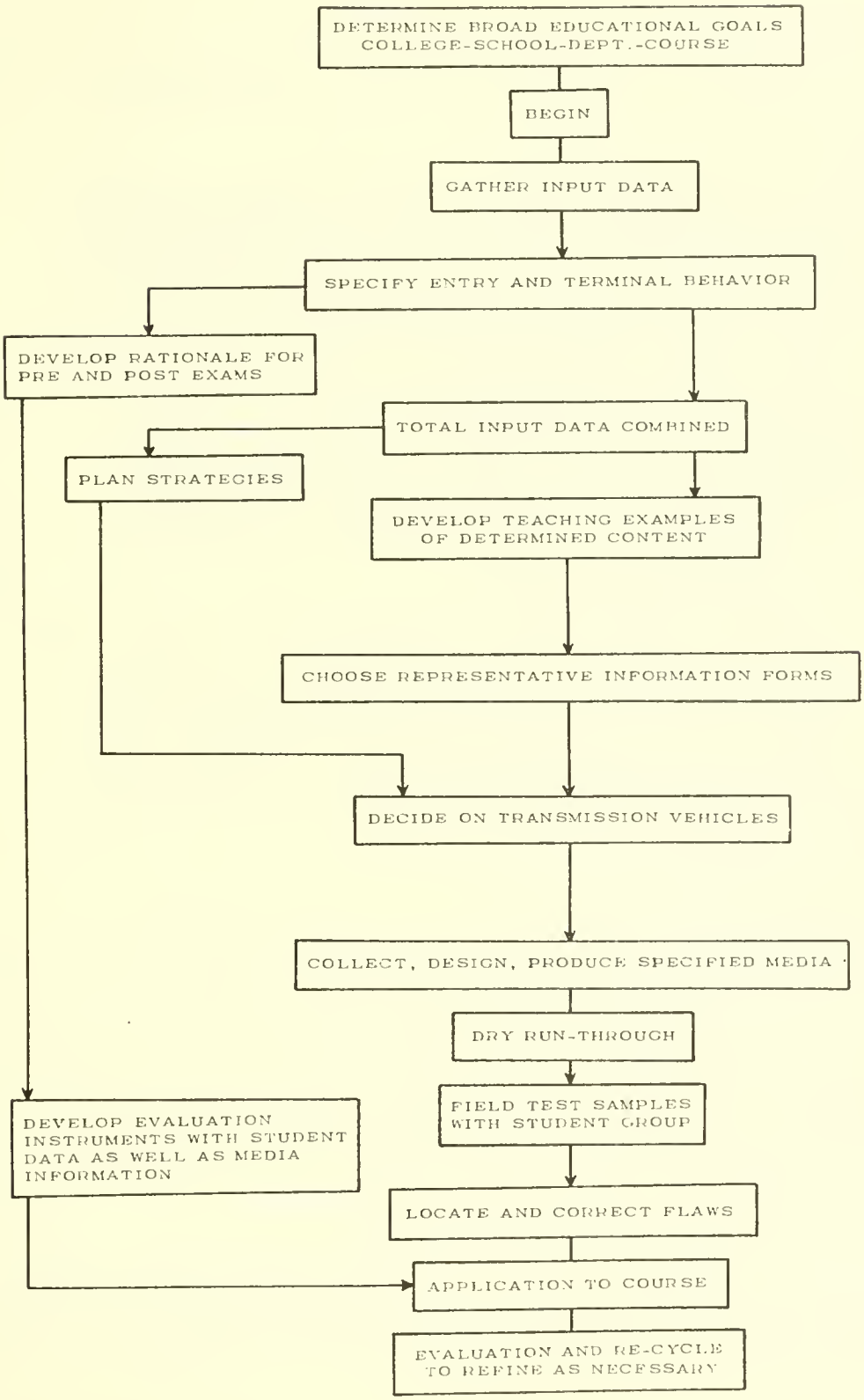
The notion of processes, whatever they may be, and interdependent subsystems is far from new. The way of conceiving and labelling them, however, is a matter of importance. For this exercise, the terms were chosen in part inductively and in part as dependent variables. That is, their exact framing was taken as dependent on the availability of some ongoing and developing stream of theory and research, in each instance insofar as possible, in order to enrich the meaning of the terms and the potential in this way for adding to knowledge in the field. The hope is that of relating process and system to larger substantive and human considerations. The arrows in the diagram do not really go in but one direction. Most people should be concerned with more than one box. The boxes, the boundaries, and the arrows, in the final analysis, are more in the mind than elsewhere. And these can be adapted so long as the mind can be adapted as well.

Experimentation in instrument system development at Michigan State University produced a "Flow Chart of Procedures for Analysis of Instruction and Implementation of Newer Media of Communication" (Figure 3.2, page 3-5) which provides a normative representation of the process that should be followed in evaluating and improving university level education.[1]

---

[1] Berson, John, Final Report (Grant No. OE-5-16-02J) Instructional Systems Development: A Demonstration and Evaluation Project; Michigan State University, July, 1967.

Figure 3.2 Instructional Systems Development Project
Flow Chart of Procedures


DETERMINE BROAD EDUCATIONAL GOALS COLLEGE-SCHOOL-DEPT.-COURSE
BEGIN
GATHER INPUT DATA
SPECIFY ENTRY AND TERMINAL BEHAVIOR
DEVELOP RATIONALE FOR PRE AND POST EXAMS
TOTAL INPUT DATA COMBINED
PLAN STRATEGIES
DEVELOP TEACHING EXAMPLES OF DETERMINED CONTENT
CHOOSE REPRESENTATIVE INFORMATION FORMS
DECIDE ON TRANSMISSION VEHICLES
COLLECT, DESIGN, PRODUCE SPECIFIED MEDIA
DRY RUN-THROUGH
FIELD TEST SAMPLES WITH STUDENT GROUP
DEVELOP EVALUATION INSTRUMENTS WITH STUDENT DATA AS WELL AS MEDIA INFORMATION
LOCATE AND CORRECT FLAWS
APPLICATION TO COURSE
EVALUATION AND RE-CYCLE TO REFINE AS NECESSARY

In 1967 Marvin Alkin at U.C.L.A.'s Center for the Study of Evaluation of Instructional Programs proposed "An Evaluation Model" focusing on an individual school or school district. The basic elements of his structure are summarized in Figure 3.3, page 3-7 and in the following excerpt from his working paper.

> There are two categories of input to the school: student and financial. Moreover, there are a group of mediating variables within the school. Some of these variables are "costly" and require the utilization of financial inputs; others are relatively cost free. Finally, there are a number of external social, political, and economic systems impinging upon the school. These factors taken together produce a number of outputs. Some of these are student outputs (such as changes in attitudes, skills, etc., of students); others are incidental or non-student outputs (such as program-caused or program-related changes in external systems). In succeeding paragraphs, we will consider each of these elements individually. For ease of communication, we will hereafter refer to the school as "the system." The system and its external systems will be called the "macro-system".
>
> One final note must be added: We recognize that there are great overlaps between individual elements of the macro-system. However, to avoid confusion in the discussion of the model, we will think of the elements as being reasonably discrete. Thus, for example, certain aspects of the description of the student inputs are, to a great extent, a reflection of external social systems. They will, however, be considered in one category alone.[1]

A Sequential Process View

From a broad perspective the university level education process might be described with an illustration of the type shown in Figure 3.4, page 3-9. Students graduating from public high schools or private preparatory schools are faced with a career decision. They may seek a job. They (young women) may raise families. The young men may be eligible for the draft or consider

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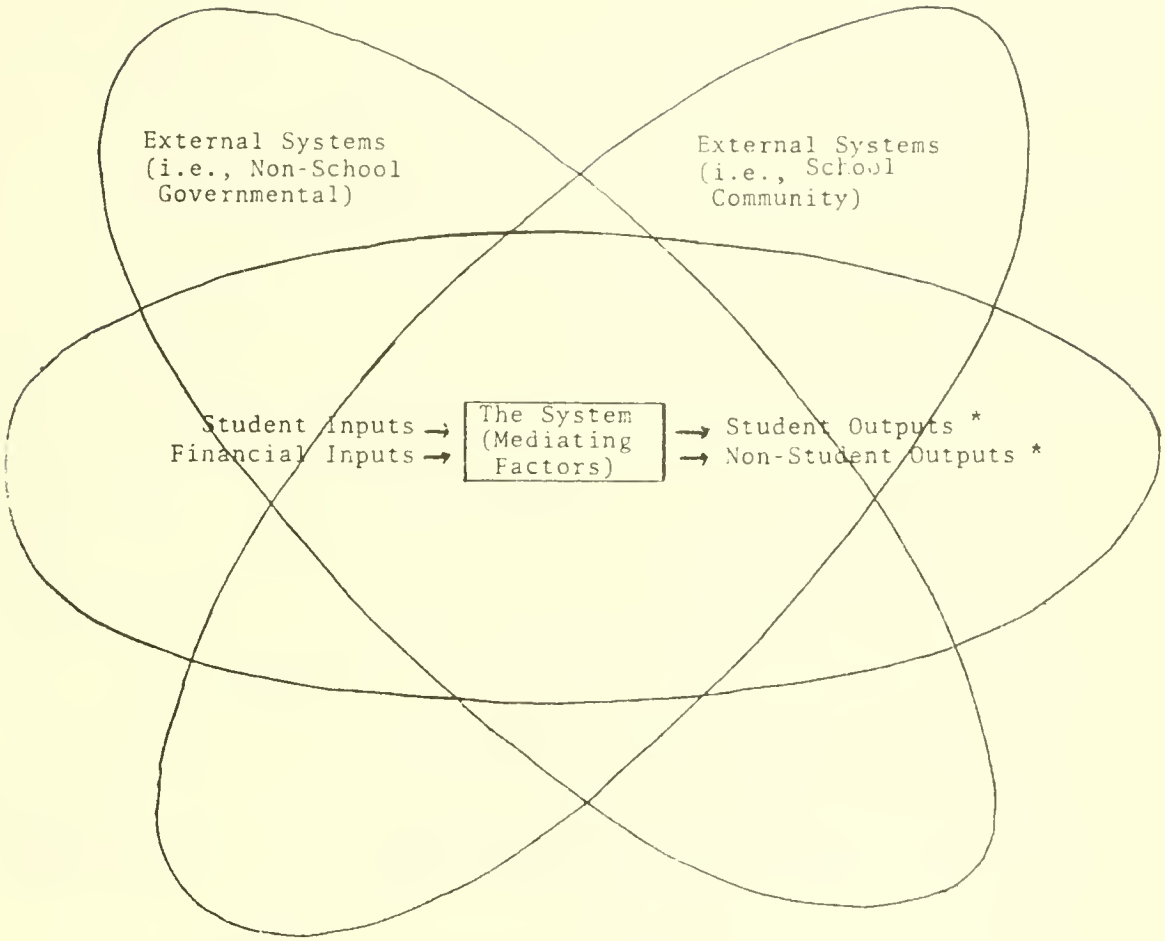
[1] Alkin, Marvin C., "Towards an Evaluation Model; A System Approach" CSEIP Working Paper Number 4, December 1967, University of California, Los Angeles.

Figure 3.3 The Macro-System of an Evaluation Model as Proposed by Marvin Alkin



*As student and non-student outputs enter the macro-system they alter to some extent the nature of the external systems and thus by extension the inputs in succeeding stages.

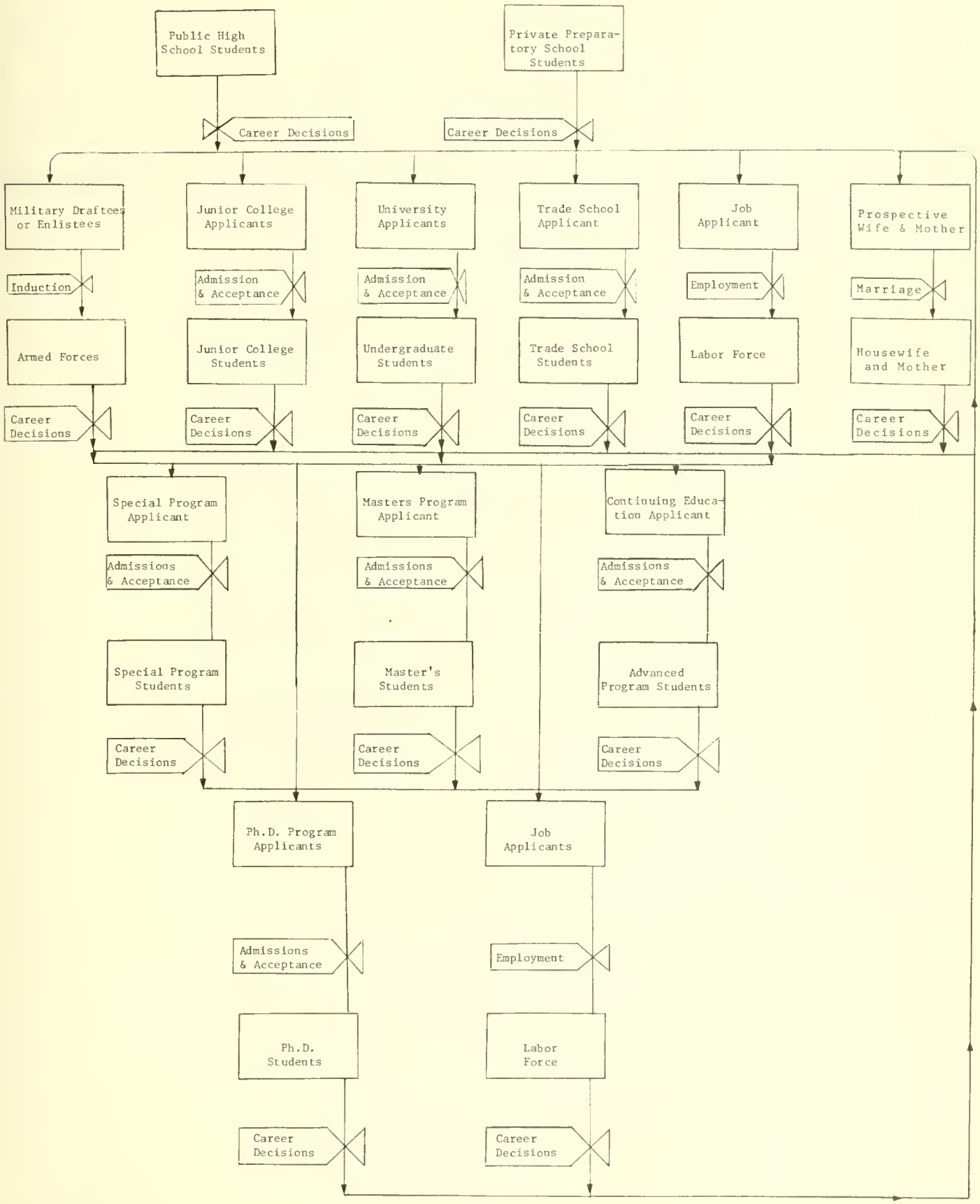
enlisting in the armed forces. Depending on the outcome of marriage, induction, employment, or admissions procedures they may become: a housewife; a junior college, trade school, or undergraduate student; a member of the armed forces; or a participant in the labor force. There are, of course, other alternatives and combinations of the above alternatives. (Military service often includes training programs, housewives join the labor force, a portion of the student population participates part time in the labor force, etc.) However, at the risk of slighting the beach boys, ski bums, "unemployed and living at home", as well as the Haight Ashbury and Harvard Square retinues, these six population groups (represented by rectangles in Figure 3.4 page 3-9) will be considered to encompass those potentially involved in undergraduate university education.

Career decisions (represented by control valve symbols in Figure 3.4) lead to transfers among categories. Those leaving the armed forces, undergraduate study, or the labor force (with appropriate undergraduate education) may apply for admission to a master's or Ph.D. program. Given appropriate admissions and acceptance outcomes these individuals become members of a student body. Following graduation (or departure for other reasons) the student is faced with further career decisions involving alternatives similar to those previously discussed.

Instead of entering a "full-time" educational program, members of these populations may elect to take limited "special studies" at a university or enroll in a continuing or advanced education program. The many "advanced management programs" ranging from one-day seminars to 10-week resident programs are representative of this type of activity.

This stark and simplistic representation of university level education serves three useful purposes. First, it identifies the alternatives available

Figure 3.4 Macro Process Flow



to the potential participant in higher education. Second, it focuses attention on the prospective student's career decisions and the institution's admission and acceptance procedures. Third, it emphasizes the multiple paths by which participants may enter the educational process.

Study Focus

The current study focuses on a limited portion of the total process summarized in Figure 3.4 - Master's level graduate management education. Decisions to include or exclude particular parts were based on three criteria.

1. The study should focus on representative decisions, responses, and interactions. Processes studied should have sufficient generality to permit extrapolation to other portions of the environment.

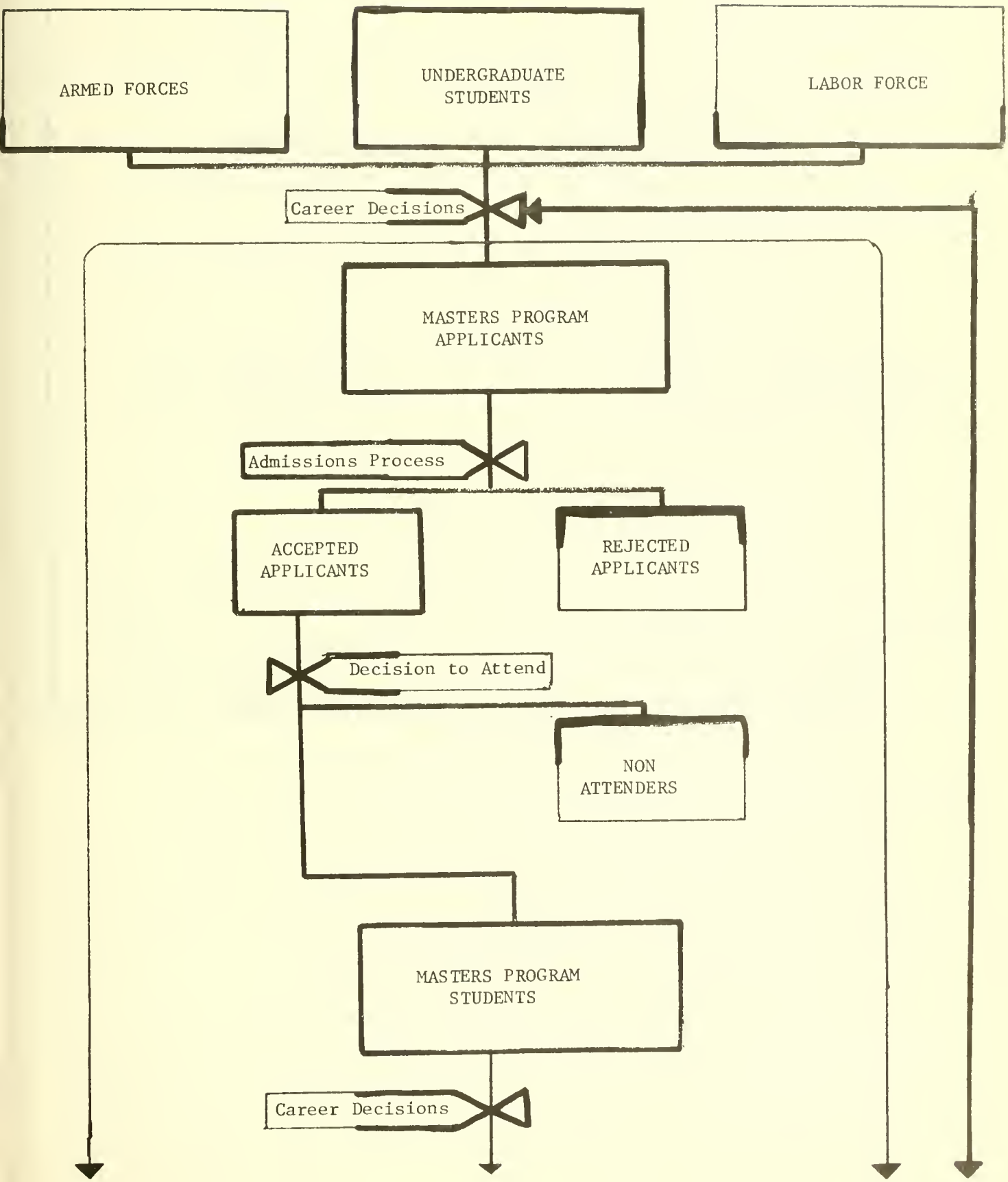
2. The study should be concerned with a limited set of managerially actionable measures. There is little value in collecting vast quantities of "interesting data". Measures should be selected to maximize information about the nature of the environment and/or the impact of specific managerial actions.

3. The study should concentrate on familiar behavior. While it may be difficult to maintain objectivity while studying the environment in which one has worked, the gains attributable to prior familiarity with specialized vocabulary, decision procedures, and sources of information are substantial.

System Boundaries

The perspective established using these criteria is illustrated in Figure 3.5, page 3-11 which provides an expanded representation of selected portions of the Figure 3.4 flow. Note that the number of prospective student "input" boxes has been reduced to "Armed Forces", "Undergraduate Students" and "Labor Force", the most common sources of Master's program applicants.

Figure 3.5 Focus of Study



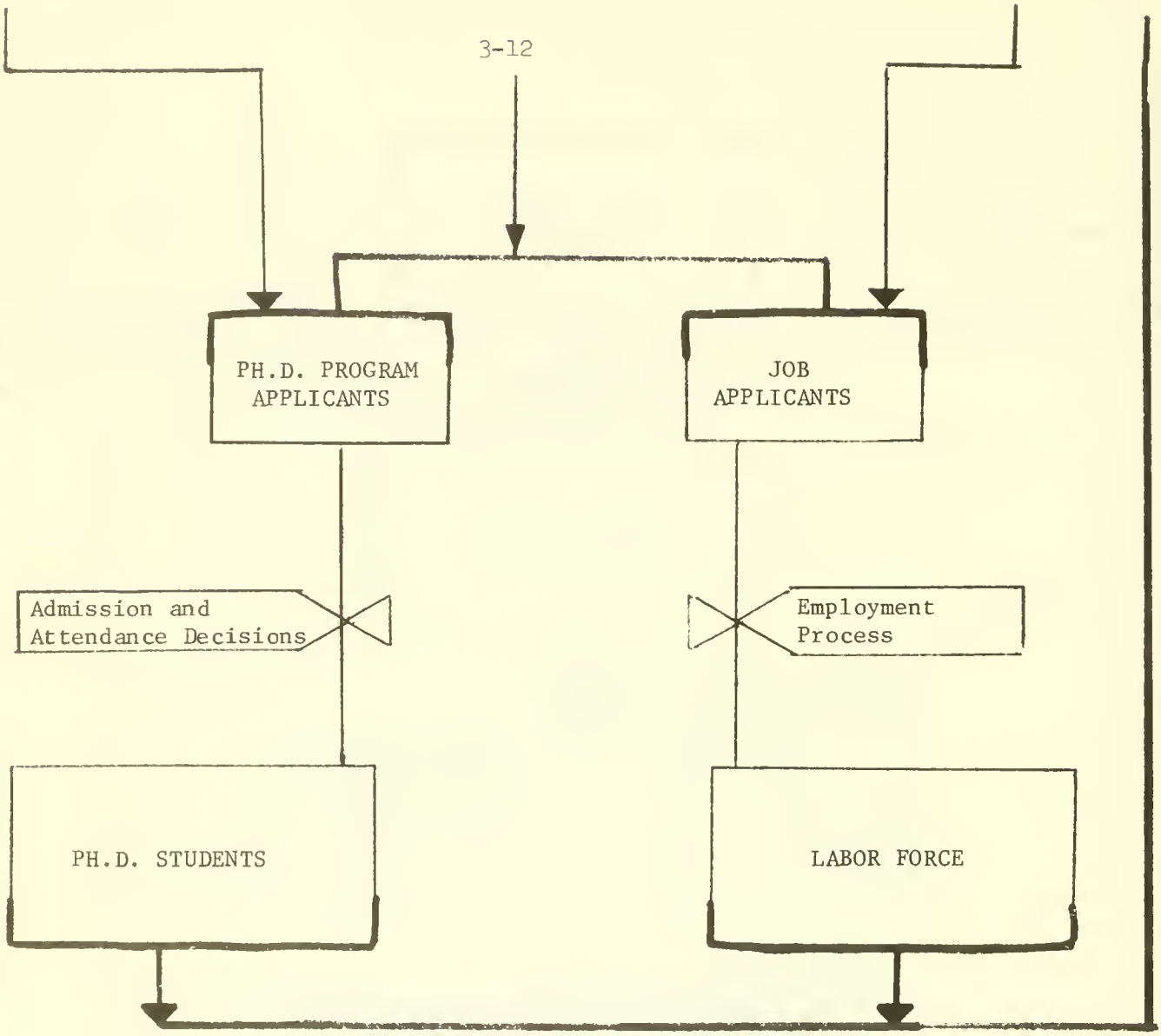


Figure 3.5 Focus of Study (Continued)

As noted earlier, point 3 of the selection criteria determined that the study would focus on Master's level graduate management education. The authors' extensive involvement with the faculties of similar programs at several universities effectively eliminated other alternatives.

Expansion of the study to encompass Master's level programs in other fields and/or undergraduate and Ph.D. programs in management was considered. Inclusion of non-management Master's programs was rejected on the grounds that such expansion would greatly increase the number of program dimensions without significantly changing the process to be studied. Undergraduate and Ph.D. programs in management were excluded on similar grounds.

On the issue of generality, a management program offers a compromise between the rigid knowledge orientation of mathematics or engineering and the self-realization or "way of thinking" objectives associated with liberal arts curricula.

It is clear that schools of management prepare "managers" to fill well recognized roles in society. However, the concept of what a manager does is relatively ill-defined. We, therefore, reasoned that it should be possible to find significantly different expectations and motivations exhibited by those entering management programs. These differences were expected to provide rich material for a study of career decisions.

Prior experience was expected to influence the prospective students' consideration of a management career as well as his decision to apply to a particular Master's program. It, therefore, appeared appropriate to distinguish among applicants from the armed forces, undergraduate student bodies, and the labor force.

Since attitudes and opinions were expected to change over time, data were obtained from students in different years (freshmen - seniors) of undergraduate programs in selected universities. It was hoped that this information might be used to study the development of relevant attitudes, opinions, and expectations

within one population subgroup.

This relatively greater coverage of undergraduate student behavior is indicated in Figure 3.5 by the solid line enclosing the "undergraduate student" rectangle.

The more limited consideration given career decisions is indicated by the partially enclosed career decision box in Figure 3.5. A similar coding scheme is used to indicate that students applying to selective master's programs, those who were accepted, and those who attended the program could be studied in reasonable depth. The "Master's Program applicants" and "accepted applicants" rectangles are fully enclosed. Less comprehensive coverage was to be given the rejected applicants and those accepted who elected not to attend an institution being studied. This condition is indicated by the limited coverage of the "rejected applicants" and "nonattenders" rectangles.

Detailed examination of the admissions procedures in one institution and evaluation by inference of applicants accepted by other institutions permitted relatively thorough coverage of the admissions process as indicated by the enclosed decision valve in Figure 3.5. Factors affecting student decisions to attend an institution and career decisions following graduation could not be as completely analyzed. The corresponding decision valves are, therefore, partially enclosed.

Since this study did not extend beyond the masters program decisions to apply to a Ph.D. program or to seek employment are beyond the boundary of this investigation. Ph.D. students do enter the study as applicants to masters programs in management.

Behavioral Processes

Discussions of the structures summarized in Figure 3.5 led to an examination of the behavior summarized in Figures 3.6 and 3.7. The population segments, decision and response processes, and educational activities identified

in these illustrations became the final focus of this study.

Figure 3.6, page 3-16, summarizes the graduate program entrance process and emphasizes the potential student's decision to apply for admission to a particular program and the impact of communication from peer group members, media, and institutions. Such communications may affect the attitudes, values, perceptions, and expectations of the potential applicant as well as his view of the adequacy of his qualifications and resources. All of these factors in turn affect his decision to make application to a particular institution or program. The previously introduced representational scheme is used in Figure 3.6 to indicate the study's focus on applicants to a limited number of programs. Clearly those applying to programs not studied in this research cannot be considered.

The second major process to be examined involves the admission procedures through which particular programs accept and reject selected applicants. Major emphasis is placed on accepted as opposed to rejected applicants since the study is primarily concerned with the processes in which those accepted by the programs included in the investigation participate.

The third major process to be investigated is the accepted applicant's decision to attend a particular program. Since the study will focus on students participating in selected programs it will be possible to say much more about entering students than "non-attenders".

Figure 3.7, page 3-17, follows students entering a graduate program through the steps of graduate education. The entering student first encounters some form of orientation process. This may involve formal interactions as part of a faculty planned orientation program, or simply informal contact with students currently participating in the program. In either event, the orientation process transforms entering students with initial attributes to "acclimated students".

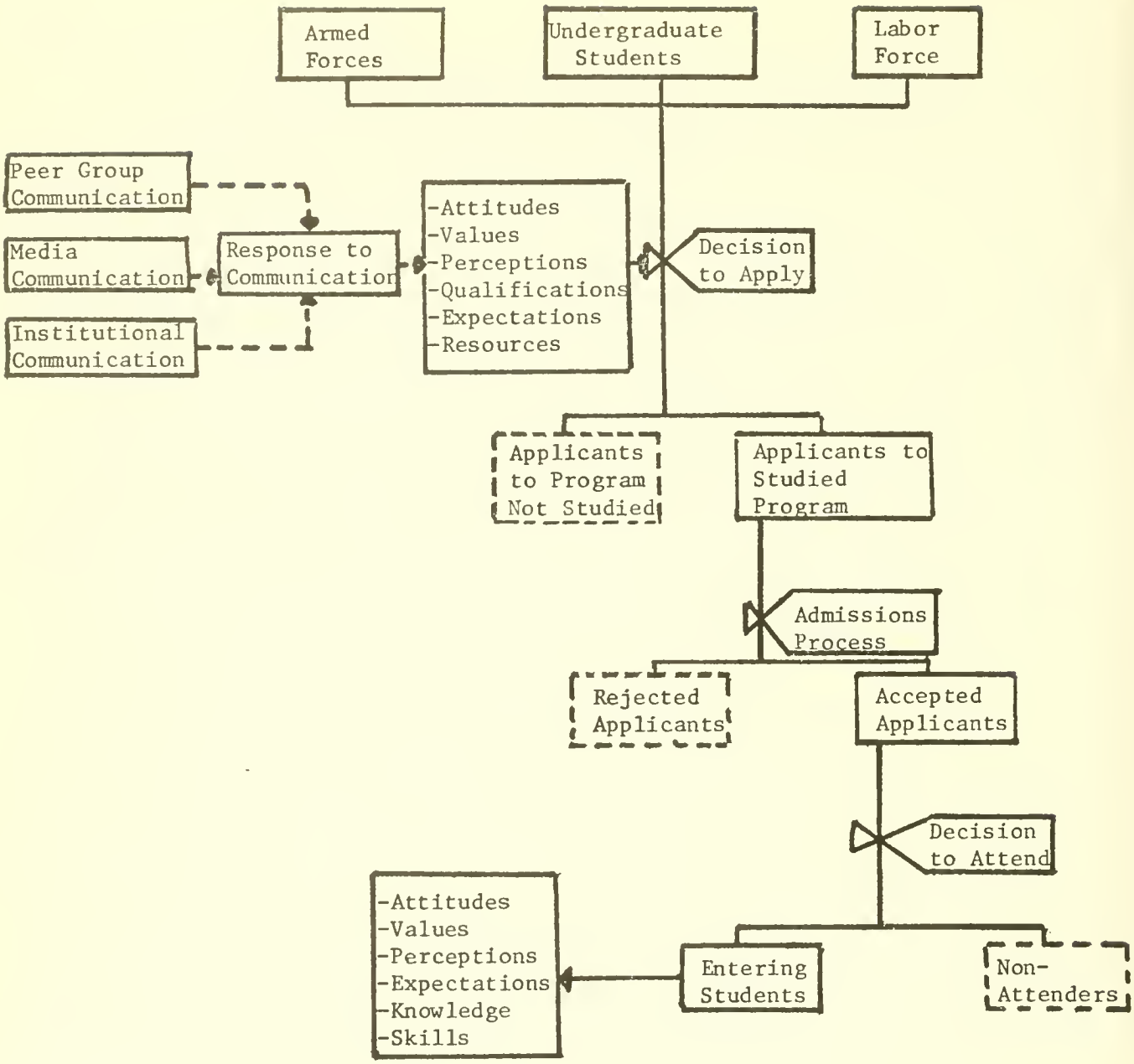
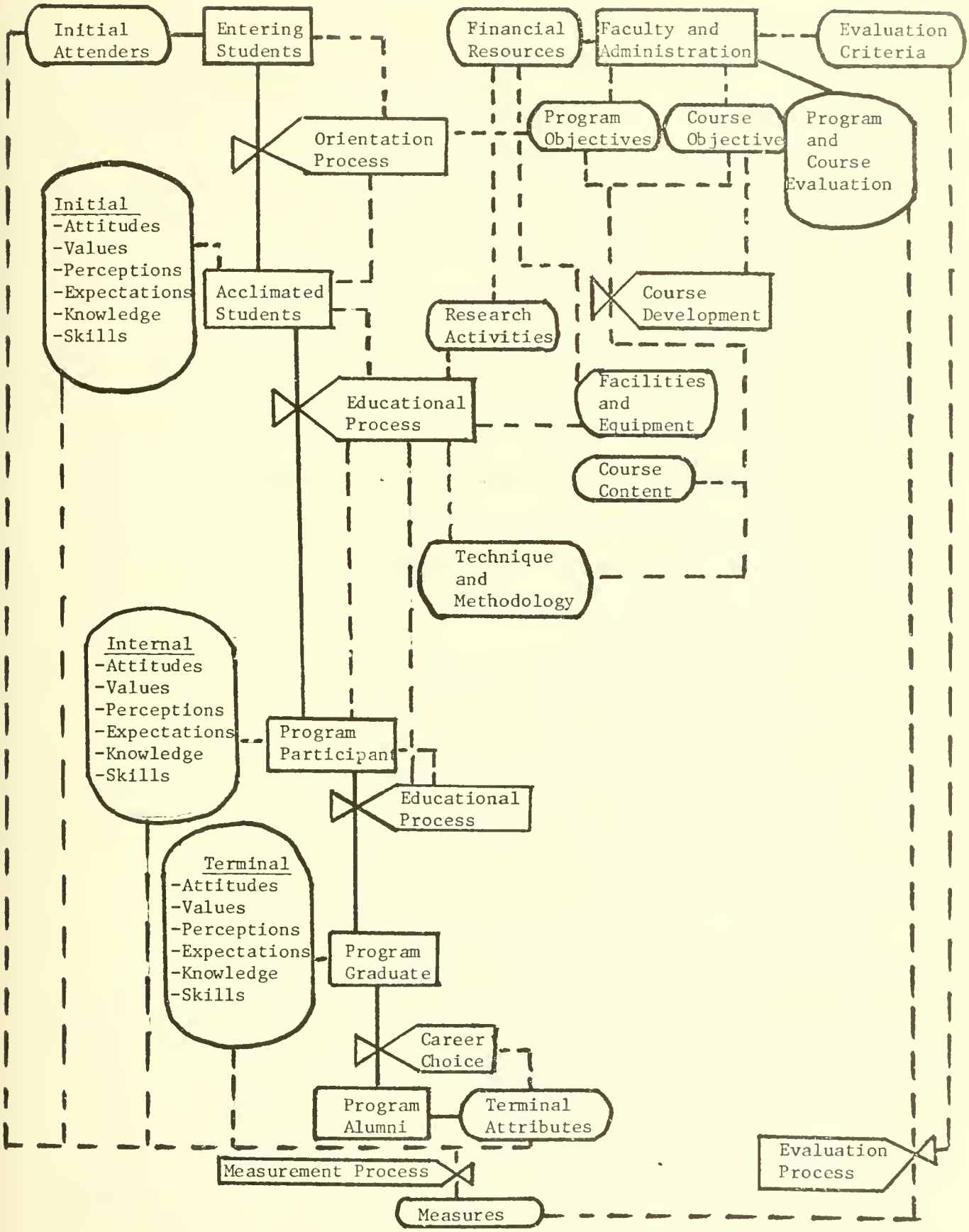


Figure 3.6 The Graduate Program Entrance Process

Figure 3.7 The Graduate Education Process



The orientation process may modify the entering student's attitudes, values, perceptions, expectations, or view of his knowledge and skills relative to those of other students entering the program.

The major focus of this study is the educational process including the impact of research activities, facilities and equipment, course content, technique and methodology. These in turn are influenced by the financial resources of the institution or program and the faculty's and/or the administration's objectives for the program and specific courses. These relationships are summarized graphically in Figure 3.7.

Once the student begins participating in the educational program his attitudes, values, perceptions, expectations, knowledge, and skills will change if the program has an impact on its participants. The major portion of this study is concerned with the definition of appropriate measures, and the applications of these measures to various programs in order to assess the nature and extent of the changes produced.

At the conclusion of a program the participants would be expected to exhibit attitudes, values, perceptions, expectations, knowledge, or skills different from those with which they entered the process. This expectation is illustrated in Figure 3.7.

Since this research project involved measuring changes occuring as program participants moved through each stage of the educational process, the measurement procedures employed became an integral part of those programs as illustrated in Figure 3.7. All educational programs involve some form of student or faculty evaluation. Therefore the existence of measurement procedures per se should not differentiate the programs studied from those existing in comparable institutions. It is important to recognize, however, that the pre-structuring and quantification as well as the extent and

frequency of measurement associated with this study may have sensitized the participants, faculty, and administrations of the programs examined. This inextricable interconnection between educational, measurement, and evaluation processes is also shown in Figure 3.7.

Summary

The processes on which this research focuses are extensive and complex. Formulation of a workable research design, therefore, involved the creation of a framework focusing on a limited portion of the total university education process. This chapter has summarized the steps through which this framework evolved. Eight major decision and response processes have been identified:

1. the potential participant's decision to apply to a particular program,
2. the admission process determining which applicants are accepted and rejected,
3. the potential participant's decision to attend a program after he has been accepted,
4. the orientation process acclimating entering students to the institution and its program,
5. the educational process applying the institution's resources to achieve specific program and/or course objectives,
6. the change process through which initial attitudes, values, perceptions, expectations, knowledge, and skills are modified as a result of participation in a program,
7. the measurement procedures assessing program characteristics and participant attributes, and
8. the evaluation process through which faculty and administration interpret information obtained from the educational process and modify program and course objectives.

Measures developed to study each of these processes are discussed in the following chapter.

Chapter 4

The Measurement Process

> "Man (in good earnest) is a marvellous, vain, fickle, and unstable subject, and on whom it is very hard to form any certain and uniform judgement."[1]

The framework described in Chapter 3 provided the structure for this study by focusing research on a limited number of decision and response points that could affect or be affected by the educational manager.

In one sense this structure might be viewed as a simplified theory of how the graduate education process functions. It implies a relatively straightforward sequence of events involving a limited number of key decisions. If this representation is valid, the administrator who can obtain even crude measures of the conditions and processes associated with these decisions should be able to manage his educational business more effectively. This belief motivated our interest in measurement.

We were concerned with the management of a Master's Program. The framework described in Chapter 3 represented an effort to organize our ideas about the nature of the process to be managed. We wished to identify the major elements that determined the productivity of our "business". There was little motivation to develop a complete model of the entire educational system. The need was for a reasonably concise framework that might help us to apply resources more effectively and to make decisions on the basis of a more organized view of the environment.

Once our theories had been formalized in a framework, measurement became a primary concern. From a research viewpoint we needed measures

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[1] From the Essays of Michel de Montaigne, Quoted in Black, Hillel They Shall Not Pass, New York: William Morrow and Company, 1963.

that could be used to validate or correct our understanding of the educational process. Managerially, we wished to develop measures for those points in the process where additional information might lead to more rational, effective, or efficient policy formulation and decision making. The most important measurement points generally involved either decisions and responses of prospective and actual students, or major interactions through which program resources were made available to program participants.

The administrator's or researcher's approach to measurement is strongly influenced by his attitudes toward the individuals or process to be measured. Student-oriented data, for example, can be viewed as information about one type of "raw material" entering the educational "plant". Or in contrast, student-related measures may be perceived as feedback from program customers. The importance attached to either of these views is a matter of subjective preferences.

Is education a production process designed to produce high quality output to specification -- the "whole man" of which M.I.T. administrators sometimes speak? If this view prevails, primary concern should be with the attributes of the raw material input and its appropriateness for the intended process. On the other hand, education may be viewed as a service provided for the benefit of those who choose to pay for an opportunity to consume one of several competitive brands of educational experience. The educational manager who adopts this perspective is more apt to view data from his student customers as indicators of market and user satisfaction.

The significance of these perspectives obviously extends far beyond the approach to measurement. Arthur Lean has recently noted that faculty members who adopt the student-as-raw-material orientation frequently

> ...believe that students are a necessary evil and a backward, inferior lot; that respect and concern for students is somehow a sign of weakness; that pomposity and superciliousness toward students is, after all, no more than they deserve.

> Many a toiler in the educational vineyard has remarked upon the spectacle of professors who seem to assume that the institution which they serve exists primarily for them and their convenience, and only incidentally for the students, who are treated as "the lowest form of college life." But, obviously, the faculty members are at once the employees and, in a sense, the servants of those students. ... Unfortunately, there are more than a few teachers who seem convinced that anything more than a mere mechanical, routine effort on their part is "soft pedagogy"; that deliberate obscurantism, trickery, cheating, and all sorts of unethical practices by the teacher are actually laudable and perfectly legitimate aspects of the educative process; and that the best way to maintain academic respectability and high scholastic standards is to make it as difficult as possible for students to learn anything.[1]

Similar dual perspectives influence views of the interactions through which faculty and facilities enter the educational process. Given a production perspective, the academic staff may be viewed as a resource to be allocated to achieve specific output objectives. A student-as-customer market orientation may place emphasis on the allocation of faculty resources to maximize student or alumni

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[1] Arthur E. Lean, And Merely Teach, Southern Illinois University Press, Carbondale, Illinois, 1968, page 23.

satisfaction. On the other hand, recognition of the market value of a faculty roster of prestigious names may lead administrators to regard the faculty as the prime consumer of the institution's resources. In this case, measures of faculty satisfaction may replace student data on the grounds that the student consumer will shop where the faculty names are sold (or at least, seen).

The remainder of this chapter is devoted to a discussion of issues and conditions influencing our choice of measures and measurement procedures. Our intention is to describe the institutional and human factors affecting the design and implementation of this research; not to present a formal discourse on methodology.[1]

Entrance Process Measurement Points

Figure 4.1 identifies seven measurement points in the graduate entrance process previously illustrated in Figure 3.6. (See Figure 4.1 page 4-5) Measures associated with these process points focus on: (1) the content of institutional communication (2) the qualities and qualifications of prospective program applicants (3) the attributes of applicants to a particular program (4) the information available to and used by those responsible for the admission process (5) the characteristics of students accepted and rejected by the admissions process (6) the distinguishing features of those accepted for a program who attend or decline

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[1]The reader interested in a description of alternative tests and evaluative criteria is referred to Thorndike and Hagen, Measurement and Evaluation in Psychology and Education, New York: John Wiley & Sons, Inc., 1969. (See particularly, "Planning a Test", pages 30-75.)

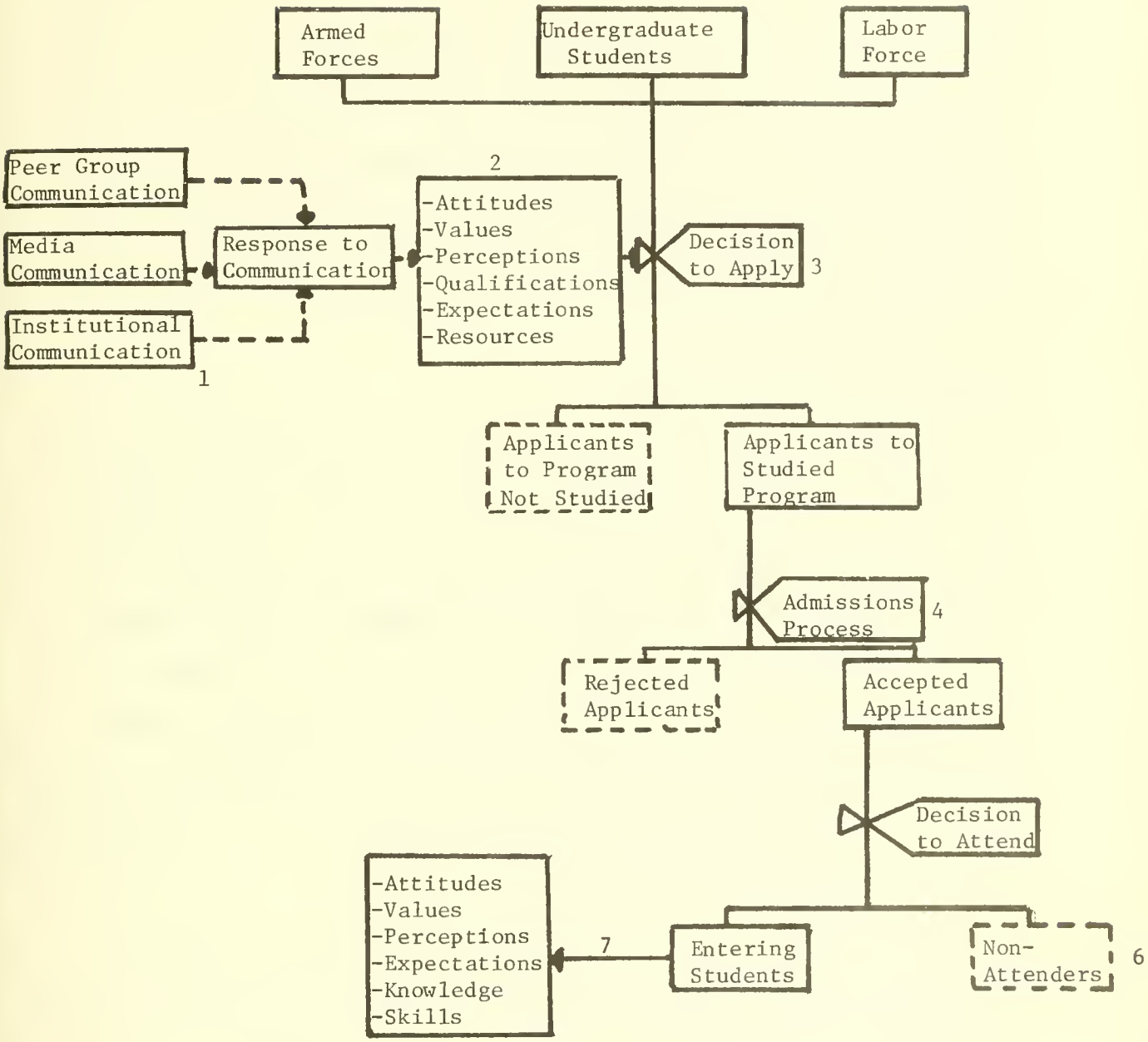

Figure 4.1 Measurement Points in the Graduate Program Entrance Process

and (7) the attributes of students entering the program.

The information collected at each of these measurement points was influenced by both research objectives and management issues. It is therefore appropriate to briefly recount the research considerations and management questions underlying the formulation of measurement procedures at each process location.

Institutional Communications

Concern over prospect response to institutional communication was related to policy questions regarding the appropriate degree of "marketing". Should substantial resources be devoted to glossy brochures extolling the virtues of our program? For that matter, what do prospective students view as "virtues"? Are personal visits by faculty members to undergraduate schools productive? If so, what kind of faculty member is effective in this role? How much and what type of information regarding course content, program facilities, faculty, etc. are prospective applicants interested in receiving?

These management questions translate into two research problems: (1) to establish the relative importance of institutional communication in the prospective applicant's information acquisition process; and (2) to determine the relationship (if any) between current student perceptions and prior institutional communication.

These research requirements produced two measurement objectives: First to determine the extent to which students obtain information about alternative programs via word of mouth discussion, university catalogues, undergraduate counsellors, graduate school interviews, multiple insti-

tution data sources such as the Educational Testing Service, and Graduate School catalogues and brochures, and second, to identify student percpetion of specific educational institutions (characteristics associated with these institutions) and the value (positive or negative) placed on selected attributes. Earlier studies here demonstrated that student perceptions of institutions differed. However, the nature and causes of these perceived distinctions remained to be determined. Questions used to obtain data relating to this process element are summarized in Table 4.1. Questionnaires assessing the relative importance of different information sources to the application decision were administrated at a single graduate school. Student perceptions of institutions were measured for all graduate schools studied.

Table 4.1 Institutional Communication Process Questions

The following questions were used to obtain student perception of their decisions to apply to particular graduate schools.

(1) To which business school(s) did you apply?

(2) What percentage of the meaningful information you obtained about graduate schools of business did you receive from the following sources:

.catalogues from specific schools
.outlines in ATGSB-type handbooks
.undergraduate counseling
.general word of mouth
.other (specify)

(3) Did your attitudes toward management education change during the process of selecting a graduate school of business? If so, how?

(4) Did your attitudes toward management as a career change during the process of selecting a business school? If so, how?

Student perceptions of institutions were measured by responses to the following questions.

Below is a list of possible strengths and weaknesses of educational institutions. On a 7-point scale indicate your perception of whether the characteristic was a positive or negative factor in your rating of your particular graduate

school. Mark a 4 if the characteristic was not relevant in your ranking.

1. Quantitative emphasis
2. Research opportunities
3. Qualitative emphasis
4. Strength in your specific field of interest
5. Social opportunities
6. Size of school
7. Opportunity for specialization
8. Prestige of school
9. Required courses
10. Case studies
11. Integrated program
12. Practical experience available
13. Location
14. Cost and financial aid offered
15. Faculty
16. Campus environment and facilities
17. Breadth of program
18. Type of student attending
19. Community involvement

The following categorization scheme was used to code information from the catalogues of graduate schools of management studied:

(1) Quantitative emphasis: (mathematics and system courses required)/total courses required

(2) Required courses: semester hours required

(3) Opportunity to specialize: number of optional course sequences including three or more courses in a single subject area

(4) Faculty quality: student faculty ratio and percentage of faculty members holding doctorates

(5) Cost and financial aid offered: tuition, room and board, and expenses stated in catalogue and the types of financial aid available

(6) School size: number of full time students in the graduate program

Attributes of Potential Applicants

Consideration of the attributes of potential applicants to graduate schools of management was motivated by the combination of policy questions noted in conjunction with the institutional communication issue. The

contrasting views of potential applicants as educational process inputs and educational program customers were again present.

The two major research objectives guiding collection of these data were: (1) to establish the attributes and qualifications of potential applicants to graduate management programs; (2) to determine similarities and differences among students in selected undergraduate programs and graduates from those programs who might consider graduate management education.

The focus on potential applicants in undergraduate programs as opposed to the armed forces or labor force was a result of pragmatic research and management considerations. From a research point of view it was easier to establish stratified samples of students attending a range of undergraduate institutions than to obtain comparable samples in the armed forces or labor forces. From a management standpoint undergraduate students constituted the most relevant population subgroup. This is due to the fact that a majority of students entering graduate programs in management come from that population segment and the options for communicating with undergraduate students far exceed those available for communication with the other population subgroups.[1]

Measurement procedures applied to this population segment were designed to obtain several classes of data, specifically, demographics, educational

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[1]For the academic years 1968-69, 1969-70, and 1970-71 the Alfred P. Sloan School of Management Report(s) of the Dean indicate that 60, 66, and 67% (respectively) of the incoming student population did not have any prior graduate training, military service or work experience, i.e., they were presumably entering the school directly upon completion of undergraduate work.

expectations, attitudes toward graduate study,[1] career objectives, current self perceptions, perceptions of an "ideal self", perceptions of "a typical business man" and personal opinions regarding business and management. Specific questions are summarized in Table 4.2. The "Undergraduate Pre-Term Questionnaire Booklet" used in this portion of the study is presented in the Appendix.

Table 4.2 Undergraduate and Potential Applicant Questions

Questions used to obtain information from undergraduate students as part of the study of potential applicants' attributes are summarized in this exhibit.

Demographic Data

(1) Mother's and father's occupation
(2) Mother's and father's employer
(3) Mother's and father's education
(4) Number of older and younger brothers and sisters
(5) Religious affiliation and extent of commitment
(6) Employment experience

Educational Expectations

(1) Relative importance of institutional characteristics (e.g., research opportunities, social opportunities, size of school) in choice of undergraduate school attended
(2) Expectations regarding the relative importance of specific educational activities (e.g., independent research, community projects, extracurricular activities) in the achievement of career objectives
(3) Relative amount of change along various dimensions (e.g., ability to think creatively, ability to work with people, knowledge of techniques) expected as a result of present studies

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[1] Readers interested in pursuing other studies relating student background, educational expectations, attitudes toward graduate study and self perception (measured by 28 semantic differential pairs) are referred to a study conducted at Yale University by Dr. Benjamin Schneider, "Some Differences Between Students About to Study Industrial Organizational Psychology in Psychology and Non-Psychology Departments." (The paper was a contribution to a symposium, The Changing Role of Industrial Psychology in University Education, E. E. Lawler (Chm.) presented at the American Psychological Association Annual Convention, Washington, D.C., August 31, 1969.)

(4) Major field of study
(5) Plans to pursue graduate study at the Masters or Ph.D. level
(6) Interest in specific field of graduate study
(7) Relative importance of various considerations (e.g., earning potential, family pressures, professional accreditation) motivating consideration of graduate study

Career Objectives

(1) Type of organization desired in first job and after twenty years
(2) Salary expectations during first year and after twenty years
(3) Choice of life styles
(4) Relative importance of various characteristics (e.g., advancement potential, job security, high status) in selecting a job

Semantic Differential Descriptions

Adjective scale (e.g., relaxed-anxious, competitive-non-competitive, inflexible-flexible) descriptions of:

(1) "You as you see yourself"
(2) "You as you would like to be"
(3) "A typical business man"

Personal Opinion

Extent of agreement or disagreement with statements regarding business and management. For example:

(1) "Governmentally operated projects cannot compete with private enterprise because they are less efficient."
(2) "Group decisions are generally more conservative than what the leader of the group would have done had he decided alone."
(3) "The man who gets ahead in industry is the man who has someone sponsoring him."

The semantic differential and personal opinion scales used in this and other questionnaires were based on instruments developed and validated by Professor Edgar H. Schein of the M.I.T. Sloan School of Management.[1]

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[1]The original semantic differential scales (from which our scales were eventually derived and added to) were developed and applied in research reported in a M.I.T. Working Paper (#231-66), "The Student Image of the Teacher" by Edgar H. Schein and Douglas J. Hall, 1966. The authors used 36 adjective pairs to descriminate between "good" and "poor" teachers.

The Personal Opinion Questionnaire used in this research was developed by Professor Schein. The results of his research using this instrument, "Attitude Change During Management Education" was published in the Administrative Science Quarterly, Vol. II, No. 4, March 1969, pp. 601-628.

Applicant Attributes

Managerial considerations motivating interest in the attributes of applicants to graduate management programs follow naturally from those noted when discussing potential applicants. The manager responsible for an educational program is concerned with the characteristics of the input to (or customers for) his program. He is also interested in assessing the relative quality of students attending his program and other institutions and those choosing the profession with which he is associated as opposed to alternative careers.

Whether one adopts an input or customer perspective, the same question must be answered. "What is quality?" Initial responses tended to be involved, esoteric, and/or ambiguous. These broad generalities were ultimately reduced to a limited set of crude, but managerially useful, measurements. These, in addition to the previously discussed measures of potential applicant attributes, were used to describe the characteristics of program applicants.

Questions added to the potential applicant set included: the applicant's undergraduate grade point average, a subjective assessment of the relative meaning of comparable grade point averages at different institutions, the number of undergraduate courses of various types taken, undergraduate activities, experience, scores received on the Aptitude Test for Graduate Schools of Business (ATGSB), and qualitative coding of letters of recommendation and the student's plan for graduate study. The specific measures employed are summarized in Table 4.3 and discussed in detail in Chapter 7.

Table 4.3 Applicant Attribute Questions

Graduate program applicants examined in this portion of the study were asked to respond to the following questions:

Date of birth
Citizenship
Family status at time of registration
Courses taken: content, hours of recitation and lab work, grade received
Financial assistance required
Faculty members consulted
Academic honors, prizes, or major publication(s)
Extra-curricular activities and accomplishments
Teaching or professional experience
Interest in teaching
Business and military experience
Reasons for wishing to do graduate work in major field

In addition, each applicant was asked to have "three of your professors (... supervisor if employed)" complete a reference report requesting their "frank opinion" of the applicant's capabilities.

Each applicant was also asked to provide a transcript of his undergraduate college record and to take the Apptitude Test for Graduate Schools of Business (ATGSB). The three ATGSB scores (raw, verbal, and math scores) were included in the data set.

Admission Procedure

The admission process is the first point in the graduate program entrance sequence where the educational manager has an opportunity to exercise direct control. At earlier points in the process he may attempt to obtain better information or to respond more persuasively. However, he is constrained to play a reactive role. The admission process offers his first opportunity to become proactive.

Subject to the obvious constraint that only those who apply can be admitted, admission procedures determine the size and composition of the

student body entering a program. It is, therefore, particularly important to gain an understanding of this process and the results it produces.

The primary management objectives associated with this portion of the study are: (1) to establish the nature of the admission process -- the procedures followed and information used to evaluate applicants; (2) to determine the results of the process -- the differences between attributes of accepted and rejected applicants.

Measures used to study this process included the applicant attributes summarized in Table 4.3. In addition, faculty and administrative participants in the process were asked to describe their objectives, criteria, analytic procedures, decision rules and use of data. By tracing applicants for whom all desired measures had been obtained through the process, it is possible to determine whether procedures described by those responsible for admissions are actually followed. It is also possible to detect the presence of implicit decision rules by examining the attributes of the accepted and rejected candidates. Measures applied to this portion of the study are summarized in Table 4.4 and discussed in Chapter 7.

Table 4.4 Admission Process Measures

Measures summarized in Table 4.3 - Applicant Attributes - were also applied to the analysis of admissions procedures. Descriptive data obtained from participants in the admissions process included:

(1) Process objectives -- number of students desired and distribution requirements (if any)
(2) Qualitative criteria -- general description of desired attributes
(3) Process flow description of the steps taken in evaluating applications
(4) Information measures used
(5) The classification scheme through which applications are categorized
(6) Procedures followed to resolve conflicts and ambiguities

Accepted Applicant's Decision to Attend

The managerial implications of the accepted applicant's decision to attend can be overwhelming. First, there is the simple matter of numbers. Most programs attempt to control class size to insure that desired facility utilization and student/faculty ratios are maintained. When working with a relatively small class such as the one hundred students per year M.I.T. Sloan School Masters Program, a ten percent shift in admissions can create significant problems while a twenty percent error totally disrupts planned resource allocation. At the same time, there are large discrepancies between the number of applicants accepted and the number of students ultimately attending the program. Even at the relatively prestigious Sloan School, a 2.5 to 1.0 acceptance to attendance ratio is not uncommon.

The problem is further complicated by differences in the acceptance ratios for foreign and domestic students, year-to-year fluctuations attributable to the job market and draft calls, and the tendency for students to apply to increasingly large numbers of schools. This latter phenomenon can be particularly frustrating for admission personnel since the students they would most like to get are also most apt to be sought by competitive schools. The condition reaches its culmination in the case of well qualified minority group applicants.

Beyond the simple but all important question of numbers, admission personnel are concerned with the outcome of the annual admissions lottery for both image and strategic planning reasons. Obviously no reader enjoys learning that the "AAA" prospect with whom he was so impressed had decided to go to "that other school down the river."! The market oriented curriculum planner must keep a wary eye on the multiple school applicant's choice ratio (the number of applicants accepted here and there, who

went here divided by the number of applicants accepted here and there who went there) as an indicator of "what's selling."

Measures associated with this analysis duplicate those used to assess applicant attributes and admission procedures. The single data point added is the binary outcome of the accepted applicant's decision to attend.

Education Process Measurement Points

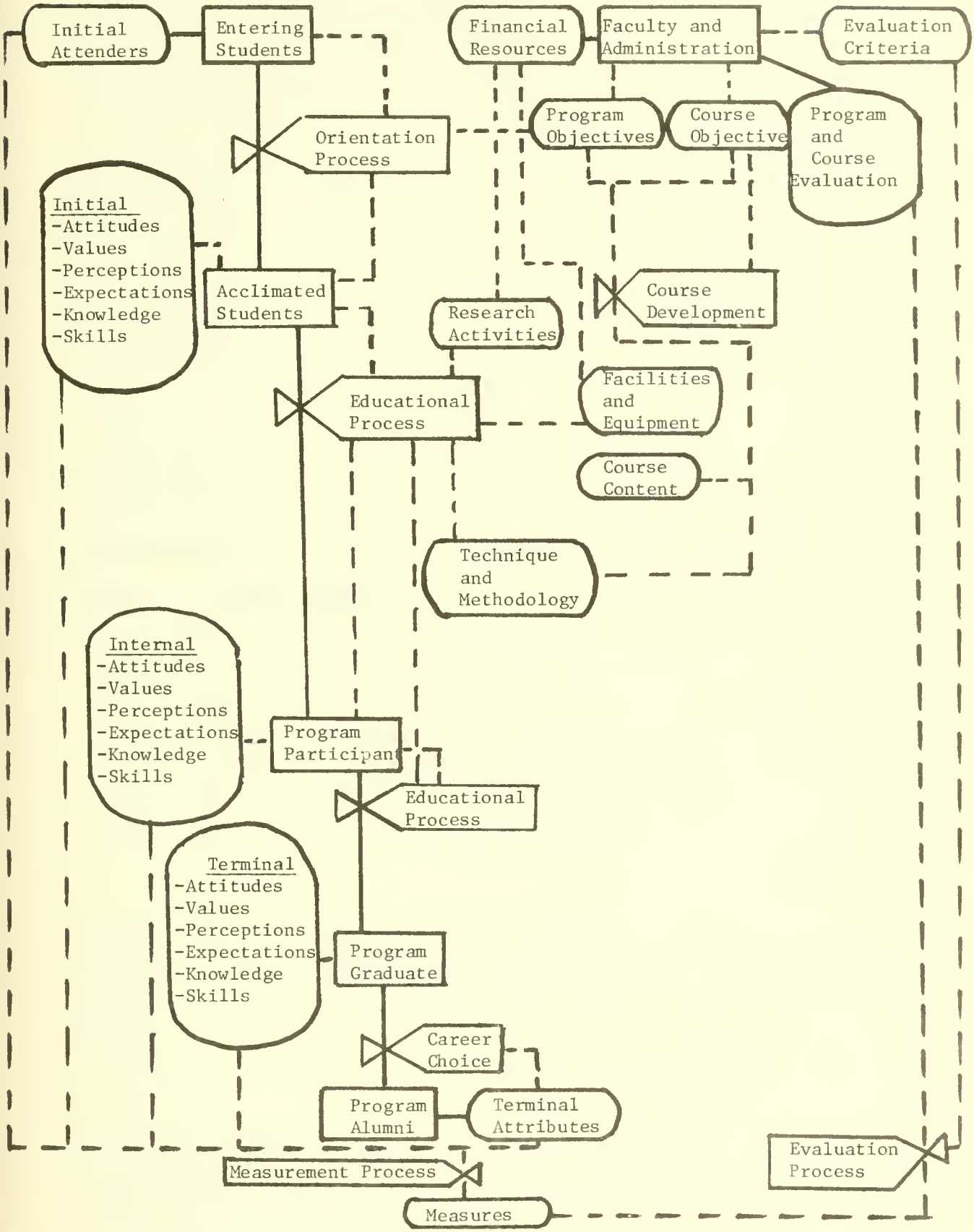
Figure 4.2 identifies nine measurement points in the graduate education process previously illustrated in Figure 3.7. These are (1) entering student's attributes (2) the impact of orientation (3) formulation of program objectives (4) the course development process (5) educational interactions (6) attributes of program participants at interim points in the education process (7) characteristics of those graduating from the program (8) the impact of measurement procedures used to obtain information about the program, and (9) the evaluation (faculty feedback) program through which the results of specific courses and the program as a whole are evaluated. See Figure 4.2 page 4-17.

Managerial as well as research considerations naturally influenced the choice of measures applied to this process as well as the earlier entrance process. This discussion will therefore continue with a description of management and research objectives underlying the formulation of the measurement procedures applied at each process point identified in Figure 4.2.

Entering Student Attributes

Measures of entering student characteristics and qualifications provide the final basis for independent evaluation of recruiting and admission practices. Once the student enters a program, it becomes difficult to separate

Figure 4.2 Measurement Points in the Graduate Education Process



the effects of pre-entering actions from those attributable to program activities. Since the terminal conditions established by the entrance process become the initial state for the educational process, entering student attributes are a primary reference for the educational manager.

The manager's first objective for research focusing on the entering student is to define a limited set of attributes that constitutes a relevant benchmark against which to assess the impact of the educational process. The second is to determine whether there is a significant difference between those students entering "his program" and those attending comparable institutions.

The research objectives associated with our analysis of undergraduate students involved definition of measures that could be used to detect differences between institutions and isolate the effect of individual programs on selected applicant attributes. The current interest in entering students involves similar objectives. It is not surprising therefore to find many of the undergraduate and potential applicant measures appearing again as entering student descriptors. Equivalent demographics were obtained for both groups except that graduate students who held full time employment prior to entering graduate school were asked about the organizations for which they worked.

Identical educational expectation data were gathered from both groups. In addition, entering graduates were asked about their area of specialization, decision to enter a graduate program, and certainty about their decision to pursue graduate study in management and to attend the graduate school they were entering.

Corresponding data obtained from undergraduates and entering graduate students facilitated direct comparison of career objectives, self percep-

tions, ideals, perceptions of the "typical business man" and opinions regarding the field of management.

Data obtained from all entering students included in the study are summarized in Table 4.5. The actual questionnaire is reproduced in the Appendix. The Allport-Vernon-Lindsey Study of Values[1] was also used with a selected subsample.

Table 4.5 Entering Graduate Student Questionnaire Content

Demographic Data

(1) Mother's and father's occupation
(2) Mother's and father's employer
(3) Mother's and father's education
(4) Number of older and younger brothers and sisters
(5) Religious affiliation and intent to practice
(6) Employment experience

Extent of Full-Time Employment and Nature of Employing Organization

Education Experience and Expectations

(1) Undergraduate major field of study
(2) Current field of business specialization
(3) Time when decision to pursue a graduate program in management was made
(4) Plans to pursue a Ph.D.
(5) Certainty about decision to pursue graduate study in business
(6) Certainty about decision to enter selected institution
(7) Relative importance of various reasons for pursuing graduate study (e.g., earnings potential, parental pressure, career accreditations requirements) as motivations to enter graduate school

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[1] Allport, Gordon W., Vernon, Philip E., and Lindzey, Gardner, Study of Values, A Scale for Measuring the Dominant Interests in Personality, Houghton Mifflin Co., Boston, Mass., 1960.

(8) Relative importance of various strengths and weaknesses (e.g., social opportunities, size of school, research opportunities) in assessment of graduate school selected
(9) Expectations regarding the extent to which various activities in the graduate program (e.g., independent research, community projects, interaction with faculty) will contribute to career objectives
(10) Expected change in personal characteristics (e.g., ability to analyze problems, attitudes toward people, knowledge of business principles) that will occur as a result of the graduate program

Career Objectives

(1) Employment objectives for first job and after twenty years
(2) Expected salary range on first job and after twenty years
(3) Characteristics desired in a job (e.g., opportunity for high earnings, security, prestige, congenial and friendly environment)

Orientation Process

The educational manager may elect to follow one of three approaches to orientation: (1) devote substantial resources to a formal orientation program (2) limit orientation activities to a welcoming dinner, or the ubiquitous sherry hour, or (3) eliminate formal orientation altogether and get on with the business of registration and classes. Since orientation activities involve student and faculty resources that could be applied to other aspects of the educational program, the educational manager should be concerned with the contribution orientation activities make to program goals.

Proponents of extensive formal orientation programs suggest that orientation activities contribute to program success in three important ways. First, by providing the entering student with factual information regarding the educational program, orientation moves expectations toward concurrence with reality. By resolving uncertainties about the program, it removes student anxieties that might hinder positive participation in educational activities. Second, by presenting information about the

institution, the orientation program enables the entering student to develop a positive image of the institution and reinforces his decision to enter the program. Third, faculty-student interaction in the orientation program helps the entering student establish personal identification with the program and its participants. This identification facilitates transition and permits the entering student to become a happy, productive, and efficiently functioning member of the community. Proponents of "T-Group" interaction during orientation are particularly concerned with this "socialization" process.

Managerial interest in the orientation process centers on changes in factual knowledge, educational expectations, group affiliations, and institutional image resulting from the orientation program. These change measures are generally surrogate indicators of orientation's impact on student ability to participate in and benefit from the educational program.

Attempts to assess orientation programs are complicated by the very short (two or five day) time period over which change must be measured and the strong motivation to give positive responses engendered by the orientation activities' emphasis on becoming an accepted member of the group. The limited time period issue was obviated by focusing on beliefs that could be significantly affected by short term communication. The favorable response bias problem was eliminated by "redefinition" when those concerned with orientation concluded that favorable attitudes should be viewed as a natural and positive result of the program, not as an undesirable bias reducing response validity.

The relative importance attached to orientation program cost effectiveness by the Sloan School Master's Program Committee appeared to be substantially greater than that imputed by other schools in the study. Data

relating to this process were subsequently gathered only at M.I.T.[1] However, the measures used focus on attitudes and perceptions common to all entering students, specifically. 1) certainty about the decision to pursue graduate study in management and to enter the institution attended and 2) post-orientation evaluation of the institution, the program, and changes expected as a result of participation in the program.

Questions used in this part of the investigation are summarized in Table 4.6.

Table 4.6 Post-orientation Questions

Questions asked at the completion of the orientation program were designed to detect short term changes in student confidence, perceptions, and expectations.

1. Certainty about the decision to pursue graduate study (19)[2]
2. Certainty about the decision to enter the program attended (20)
3. Perceived strengths and weaknesses of the institution attended (22)
4. Intended field of specialization (16)
5. Perceived present knowledge of specific fields
6. Interests in pursuing study in selected fields
7. Expected relevance of material from the study of specific fields to "your first job"
8. Expected contribution of various educational activities (e.g., independent research, outside lecturers, class discussions) to career objectives (23)
9. Expected impact of the program in change in specific knowledge, skills, and attributes (24)

Program and Course Objective Formulation

Formulation of program objectives should be among the most important functions of the manager responsible for an educational program. It can be argued, in fact, that in the absence of explicit goal setting, no clear priorities are established. After a recent tour of American universities

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[1] Limited data of this type were collected at the Sloan School during the 1968 orientation period. In subsequent years emphasis was placed on relatively detailed assessment of specific orientation activities. Because of the limited sample drawn in 1968 and the narrow focus of later analyses, orientation specific data are not presented in later chapters.

[2] Numbers in parentheses refer to corresponding items on the Graduate Pre-Term Questionnaire.

Dr. E. Edwards, Vice Chancellor, Bradford University, Bradford, England, noted that he tried to visit institutions using P.P.B.S. Systems since they were forced to at least define limited objectives.[1] As noted in the introductory chapter, one of the primary motivations for this study was a desire to establish a more orderly basis for program and course development founded on more explicit measures of program impact than had previously been utilized. The first management objective associated with our research into this aspect of the educational process was therefore to identify a set of dimensions that could be used to define objectives for the program as a whole and for courses within the program. The second objective was to determine whether it was possible to use these dimensions to measure and evaluate results produced by the program.

The measures ultimately used to specify program objectives focused on twenty-one "learning outcomes" listed in Table 4.7. Evaluation of this aspect of the educational process also involved procedures to determine administrative intent to achieve particular learning outcomes through specific courses.

Table 4.7 Measures of Program and Course Objectives

Program and course objectives were specified on the following twenty-one student learning outcome dimensions:[2]

1. Ability to analyze problems
2. Ability to apply techniques
3. Ability to formulate policy or goals
4. Ability to think creatively
5. Ability to formulate plans

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[1] Quoted in private conversation with the authors.

[2] Although these "Ability to" dimensions were initially developed and implemented at the Sloan School of Management as measures of program and course objectives, we are delighted to acknowledge the use of similarly worded sets which have cropped up in course evaluation instruments at other institutions in the last few years. Emulation is the best kind of flattery.

6. Ability to communicate ideas
7. Ability to sell ideas to others
8. Ability to induce change
9. Ability to identify problems
10. Ability to work with people
11. Attitudes toward people
12. Ability to do research
13. Ability to make decisions
14. Knowledge of techniques
15. Willingness to take risks
16. Ability to recognize own abilities and limitations
17. Goals and aspirations for career
18. Knowledge of business principles
19. Personal attitudes and values
20. Attitudes towards business and industry
21. Self confidence

The relative importance to be attributed to a given learning outcome in particular courses was assessed by asking those responsible for program planning to: (1) rank courses offered in the program by relative contribution to each learning outcome and (2) indicate on a 7 point scale (1 = no change, 7 = great change) the relative amount of change each course was expected to produce on specified learning outcome dimensions.

Course Planning and Development

The reasons for managerial concern with course planning and development parallel those associated with objective formulation. The need is for an explicit framework and evaluative dimensions along which course content, format, and methodology can be measured.

However, beyond this the requirements of course planning and development exceed those of objective formulations in one important respect. It may be exceedingly difficult to obtain agreement regarding objectives. Stating goals explicitly and measuring whether or not they have been achieved can also present significant challenges. Nevertheless, one is concerned only with results. In contrast, course planning and development involves assessment of the means to an end. In order to be administratively useful, the course planning framework must encompass diverse pedagogical means and provide the mechanisms required to evaluate the results

achieved using alternative educational approaches. It is one thing to place emphasis on developing problem solving skills; it is quite another to create the mechanisms required to assess the relative effectivenss of two different instructors or alternative preceptorial techniques in achieving this objective.

The management objective associated with this aspect of the research project was to develop a categorizational scheme that could be used to isolate courses involving similar educational processes. Such a framework would offer an attractive alternative to the traditional departmental structure on which current course planning and development are based.

This objective assumes the existence of a consistent underlying educational process. To assume otherwise is to accept the impossible constraint that each course must be viewed as a unique synthesis -- a never to be repeated interaction between an azygous faculty member and singular students. Administrator selection among these alternatives represents a pure case of Hobson's choice. If each student-faculty interaction must be treated as a unique happening, the management of education is impossible.

Development of a meaningful categorization scheme is also a precondition of organized research into the educational process. The study of unique events is the province of religion not research.

Having accepted the necessity of creating a framework, one is faced with a cornucopia of possible dimensions. To be accepted and used, a structure must be based on concepts meaningful to the faculty members and administrators whose perceptions are to be recorded and yet sufficiently precise to support quantitative analysis. While attempting to develop a vocabulary for this portion of the analysis, we were constantly reminded of Humpty-Dumpty's admonishment to Alice when he said "...in rather a

scornful tone, 'When I use a word, it means just what I choose it to mean -- neither more nor less.'"[1]

The vocabularly of course planning and development is unusually rich. Unfortunately, it is also ambiguous. For example, most academicians are happy to accept the concept of an "underlying discipline" and nod knowingly when a colleague explains that he "is concerned with a basic economics course." But what meaning do these words really convey? Is he teaching macro or micro economics? Is his approach quantitative or qualitative? Is he concerned with historic development, current practice, or emerging theory? And if he begins to answer these questions, how much useful information have we acquired?

After much discussion those involved in formulating this part of the research design produced a structure based on the concept of underlying disciplines, course focus, learning outcomes, learning mechanisms, and course flexibility. The terminology used in this structure is summarized in Table 4.8. The Instructor Pre-Course Questionnaire through which data relating to this portion of the study were obtained is included in the Appendix.

Table 4.8 Measures Used in Course Development and Planning

The following structure and measures were used in the study of course development and planning:

1. Disciplines upon which a course was based, measured in terms of instructor perceptions of the emphasis to be given specified disciplines.
2. Relative emphasis to be placed on:
   a. management functions (e.g., finance, production, marketing)
   b. framework for analysis (e.g., organizational or economic viewpoint)

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[1] Lewis Carroll, Through the Looking Glass, New York: Random House, 1946, p. 94.

c. processes in the external environment (e.g., customer behavior, economic, social, or political change)
d. external groups and institutions (e.g., capital sources, competitive industry groups, state government)
e. external perspectives (e.g., political or economic structure)
f. orientation (e.g., degree of emphasis on theory, application, subject overview)

3. Learning outcome objectives stated in terms of the extent to which the instructor would attempt to:
   a. give students experience in technique application, policy formulation, planning, communicating, etc.
   b. develop student awareness of abilities and limitations, career objectives, etc.
   c. bring about change in personal attitudes and values, attitudes toward people, etc.
4. Learning mechanisms to be used in the course described by the emphasis to be placed on problem solving, case studies, independent research papers, etc.
5. Portion of course content to be determined by students.
6. Extent of student preparation required for each class.

Educational Activities

The central focus of graduate education is the educational activities through which the student interacts with the resources of the institution.

Limited numbers of faculty and staff are concerned with the communication, admission, orientation, and course development processes noted earlier. Individual faculty members may have relatively strong feelings about these processes. However, they are of little concern to the average instructor (although he is indirectly and strongly influenced by these decisions).

When the discussion turns to educational activities, aloof indifference disappears. Suddenly every member of the faculty and staff has definite opinions about some aspect of the process and general scepticism regarding the feasibility and/or the desirability of research in this area. It is one thing to evaluate applicants or entering students. Examination of educational activities with its implicit focus on faculty as well as student behavior is quite another issue. "Is nothing sacred?"

Increased involvement in the process magnifies the importance of perspective. The previously noted contrast between production and marketing views of entering students as inputs to an educational plant as opposed to consumers of an educational service was unemotional. One view might be preferred but either perspective could be accepted. Adoption of the student-as-consumer view attached increased importance to students' attitudes and perceptions. However, the object of these student impressions was a relatively impersonal institution or program. All this changes when the object becomes the interaction between an individual faculty member or faculty group and specific and identifiable students.

Student perceptions of the environment in general may be considered irrelevant or interesting but not personally threatening. When attention shifts to the measurement of specific educational activities, otherwise sterile research design questions acquire ominous overtones. Previously irrelevent issues assume great importance.

"But who will see these data?"

"Why do you want to use those questionnaires in my class?"

"What are you trying to do, set up a popularity contest?"

"I am not sure the questions you are asking are applicable to my course. And besides, we have a great deal of material to cover in the next two weeks. I don't see how we can find time to hand out a questionnaire."

Despite these difficulties, the responsible educational manager cannot avoid asking certain basic questions. What effect is my program having on its participants? To which department should I give more resources? In which area should I add new faculty members? Which faculty members should be promoted? How should I utilize currently available facilities?

What facilities should we add? What aspects of the program should I change? How responsive should I be to student proposals for program changes? If these questions are to be answered rationally, the activities at the core of the educational process must be measured. The problems associated with such measurement as well as the need for them have been well documented elsewhere.

> The problem of defining the type of precise educational objectives and performance measures that are needed in system design work in education is... exceedingly complex. This is because the problem involves differing value judgments among both educators and the community on what the most important goals and purposes of education are, and what a school should accomplish. Measuring educational outcomes is therefore also particularly difficult because the system's objectives are multi-dimensional and include social, cultural, and aesthetic values, as well as academic performance. Even standardized achievement test scores are not very reliable since they do not take into account the socio-economic status of the home and community. These are, of course, very important determinants of both inputs into the educational system, as well as the outcomes of education. It is therefore very difficult to measure the effect of the school system itself, in terms of its performance, as separate from the influence of the surrounding community and home environment.
>
> This should not mean however, that because quantitative data in these areas are hard to get, that they never will exist and the systems analysis approach should be abandoned. The educator never will be free from making judgments. Research is continuing at an accelerated pace to develop ways of defining and measuring this type of data. We need it badly; we need to know the relationship between what is done in school and what students learn in school.[1]

The first management issue to be resolved is whether it is possible to develop consistent and significant measures of the change produced by an educational program. If this can be done, the second problem is to extend the program measures to encompass activities within the program and to establish the feasibility of ascribing program results to specific educational components.

Since the learning outcome dimensions summarized in Table 4.7 had

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[1] John F. O'Toole, Jr., "Systems Analysis and Decision Making in Education," Santa Monica, California: System Development Corporation, 1965, p. 15.

been used to specify program objectives, it was natural to attempt to measure change along these same dimensions. Assuming changes could be detected using this procedure, it would then be necessary to relate the use of specific resources to particular types of change. This meant that inputs to the program had to be evaluated. Relevant characteristics of facilities, personnel, and other process inputs included in the academic budget had to be measured.

If these inputs and outputs could be measured, the final challenge would be to relate inputs and outputs -- to develop transforms linking specific educational activities to selected learning outcomes.

Grades as Measures

On first exposure, measuring the impact of an educational activity appears relatively straightforward. Students with particular knowledge and skills enter the activity and after an appropriate period of time emerge with changed knowledge and skills as illustrated in Figure 4.3 page 4-31.[1] The manager or researcher intent upon assessing a particular educational activity merely directs an objective observer to apply objective tests of knowledge and skills before and after the activity has occurred. The situation is further simplified by some faculty members who are quick to point out that those wishing to measure the educational activity are particularly fortunate in that an objective observer (them) and objective measures of the change in student knowledge and skills (the grades they assign) are

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[1] A similar structure was used as the starting point for the ACE Cooperative Institutional Research Program. See Alexander W. Astin, "Personal and Environmental Determinants of Student Activism," an Address presented to the American Psychological Association, San Francisco, California, August 30, 1968, p. 6. A more detailed Stimulation-Response Structure is proposed by G. J. Brown and R. C. Atkinson in, "Models for Optimizing the Learning Process," Technical Report No. 92, Stanford, California: Institute for Mathematical Studies in the Social Sciences, Stanford University, 1966.

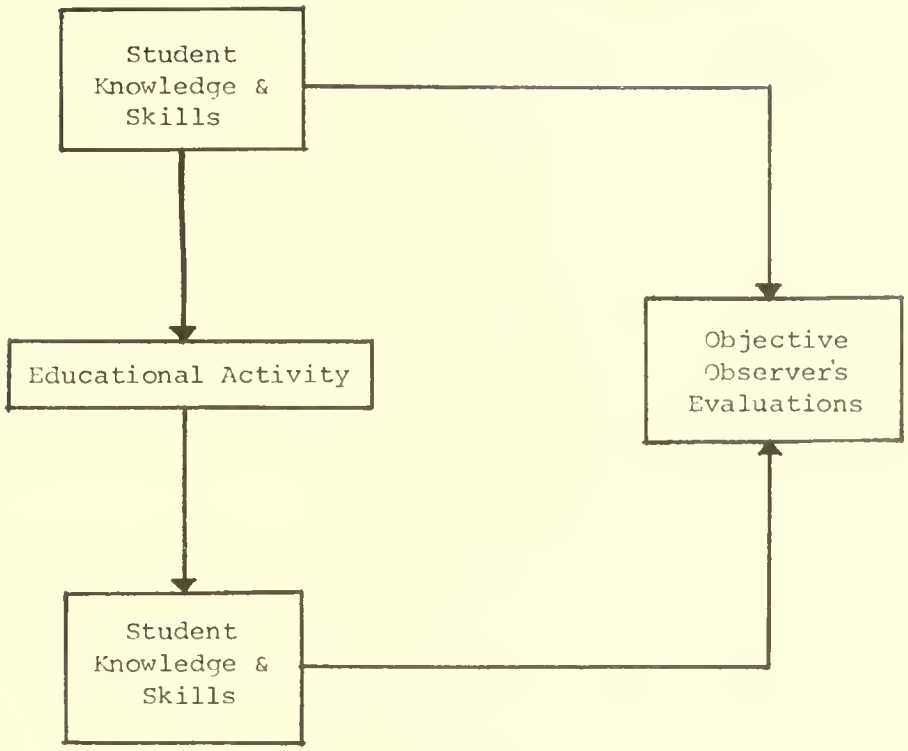


Figure 4.3 A "First Exposure" View of the Educational Activity Measurement Problem

already available as a basis for evaluation.

This line of reasoning quickly leads to the conclusion that the most effective educational activity is that in which all students receive A's while the least effective is that in which only F's are awarded. Student-faculty discussions starting from this assumption produced three "models" of the situation; two offered by the faculty and one proposed by the students. The faculty explanation involved the motivation of the students entering the activity (e.g., "They're only taking the course because it's required. They just couldn't care less.") or the standards of the instructor in charge of the course (e.g., "He never gives anything but A's. To give a B is an abject admission of personal failure."). Student perceptions, on the other hand, centered on instructor interest, knowledge, preparedness, or teaching skill. The net result was not edifying.

Other faculty members contend that grades cannot be viewed as measures of student performance in the educational activity. "They're totally meaningless. The only reason I assign them is to keep the administration off my back." The increasing popularity of this point of view among both students and teachers is well documented in the trend toward pass-fail grading. A recent study at the M.I.T. Sloan School of Management is indicative of student and faculty attitudes.

Figure 4.4 illustrates student and faculty reactions to six alternative grading procedures. The "X's" in these graphs mark the mean response; the "V's", one standard deviation on either side of the mean; the "+'s", the maximum and minimum response; and the "S's", the extent and direction of skewness represented by the cube root of the third moment. See pages 4-33 - 4-34.

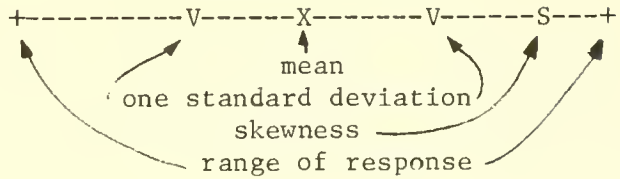
Both first and second year Masters Program students preferred the pass-fail alternative plotted in graph a. Faculty members responding to

Figure 4.4 Response to Sloan Committee Grading Questionnaire

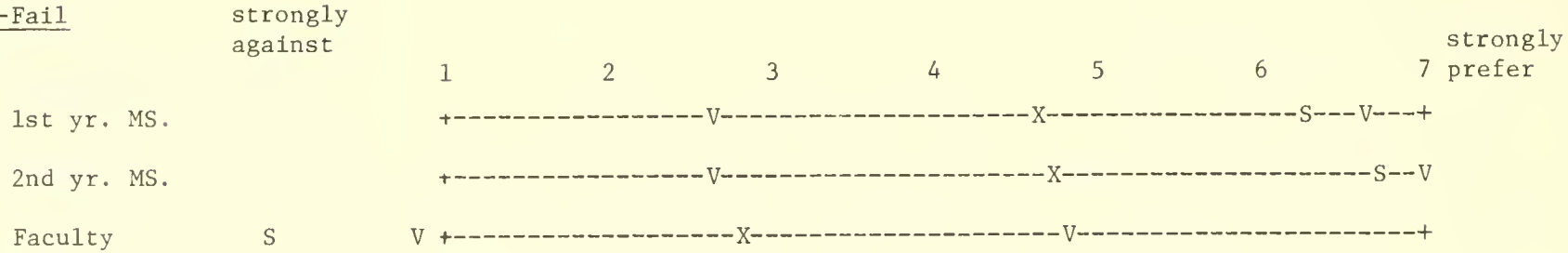
Respondents:

73 1st year Masters students
53 2nd year Masters students
22 Faculty members

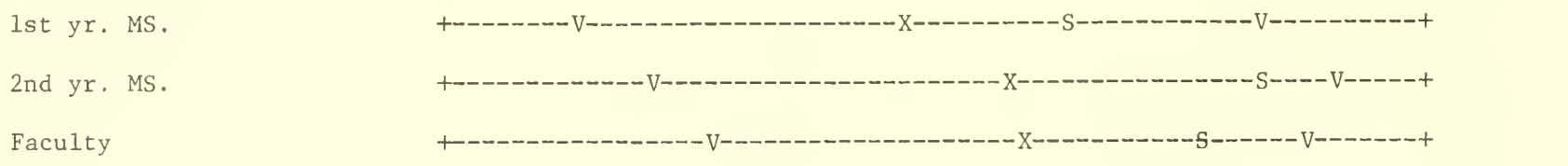
Graph Explanation



a) Pass-Fail



b) Pass with Distinction - Pass-Fail



c) Grades of A, B, C, (no fail)

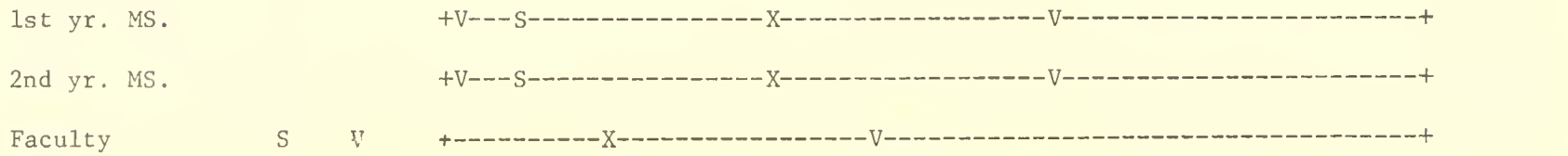
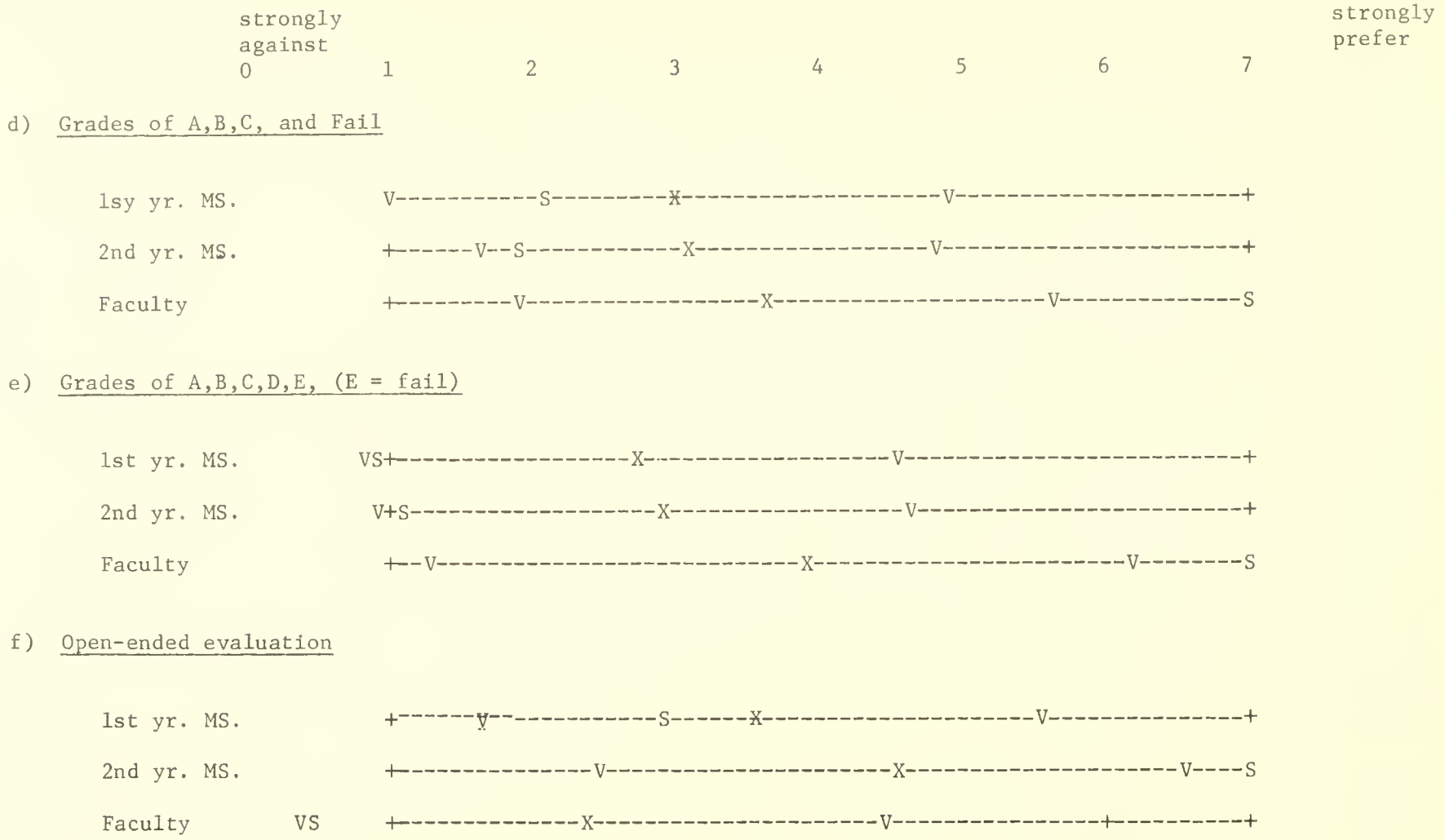


Figure 4.4 (Continued)



this questionnaire did not share the student's enthusiasm for pass-fail grading. The distribution of faculty responses to the pass-fail alternative was in fact highly skewed toward "strongly against." Faculty members responded most favorably to Pass with Distinction-Pass-Fail plotted in graph b, which gives the faculty member the opportunity to single out the best performers without having to evaluate the others whom he simply passes. Students were less enthusiastic about the Pass with Distinction-Pass-Fail alternative.

Grades of A, B, and C (no fail) plotted in graph c, won universal disapproval, with the faculty leading the condemnation proceedings. Faculty objections are significantly reduced when Fail is added to Grades of A, B, and C (graph d). If they must grade, they evidently prefer to retain the power to register extreme disapprovals (i.e., to "flunk").

Faculty members responding to this survey reacted more favorably to the concept of grading as more letters were attached (e.g., grades of A, B, C, D, E (E=fail), graph e. Note that faculty responses on graphs (d) and (e) are skewed upward although the mean score is not particularly high. Student responses were directly opposite, sinking lower as more grades were added.

Second year students were more favorably disposed toward open-ended evaluation than were first year students. However, this option received generally negative faculty evaluation.

Alternative Measures of Educational Outcomes

If grades based on instructor prepared tests are not accepted as valid indicators of knowledge and skill acquisition, the researcher may choose instruments from a broad range of alternatives. Consider for example the

armamentarium mobilized by T. W. Harrell for his study of the "Qualifications for the MBA succeeding in Business."

> Members of seven classes of the Stanford Graduate School of Business took an eleven instrument test battery aimed at management potential ... . These instruments were SVIB, MMPI Guilford-Zimmerman Temperament Survey, Leadership Opinion Questionnaire, Ghiselli Self Description Inventory; three measures developed at the Harvard Business School by Ward and Associates for a similar study-Personnel Problems, Practical Judgment, and Imaginary Events; Public Opionion Questionnaire which is a version of the California F Scale; McClelland's six picture test of imagination which is a revision of the TAT, and Individual Background Survey, a biographical inventory developed by Richardson, Bellows, and Henry, Inc., for selecting production foremen for the ESSO Company.
>
> In addition to this eleven instrument battery a number of other variables were selected to compare with earnings. These were undergraduate grade point average, second year Graduate School of Business GPA (Williams and Harrell, 1964), peer ratings of most and least preferred potential bosses in graduating MBA class, height, offices as undergraduate, strength of recommendations for entrance to GSB, age, and scores on the Admissions Test for Graduate Study in Business.
>
> A questionnaire was developed to follow-up the MBA's five years after graduation. It included Present Compensation, Starting Compensation, Job Satisfaction, Work Week, two sets of questions from Hemphill's Executive Position Description Questionnaire-Position Participation and Position Concern, Ideal Job Success, Present Job Success, and Peer's View of Job Success.[1]

Another study "Attitude Sophistication and Effective Teaching in Economics" by William Mann and Daniel Fusfeld[2] used the Opinion, Attitude and Interest Survey (OAIS) developed by Benno Fricke to obtain student scales on achiever personality, intellectual quality, creative personality, social adjustment, emotional adjustment, masculine orientation, business interest, humanities interest, social science interest, physical science interest and biological science interest. This instrument was used in

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[1] Thomas W. Harrell, "The Personality of High Earning MBA's in Small Business," Personnel Psychology, 1970, Vol. 23, pp. 369-375, p. 369.

[2] Mann, William and Fusfeld, Daniel "Attitude Sophistication and Effective Teaching in Economics," Journal of Economic Education, Vol. 1, #2, Spring, 1970.

conjunction with other author-developed measurement tools to measure the change in the level of attitude sophistication of students during a course in introductory economics.

On first exposure the comprehensive list of scales is quite impressive. However further investigation may cast doubts upon the underlying instruments used in the survey.

Consider this critique of OAIS (Opinion Attitude and Interest Survey) by John O. Crites, Associate Professor of Psychology, University of Iowa, Iowa City.

> Despite the many years of research which have gone into the construction and development of the OAIS, it must be concluded that with the possible exceptions of the Achiever Personality and Creative Personality, the inventory does not fulfill the claims which are made for it, and it is not ready for use in either vocational educational counseling or academic selection. It has scant theoretical significance; it has only minimal reliability; and it measures neither variables nor constructs with acceptable validity.[1]

Yet another position review written by Harold Webster, Associate Research Psychologist, Center for the Study of Higher Education, University of California, Berkeley, compounds the doubt.

> In brief, the OAIS represents a good beginning in the study of the expressed attitudes of college students, but will require considerably more work before it does more than contribute a small increment of predictability to a few criteria that are presently not well understood.[2]

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[1] Buros, Oscar K., ed. Tests in Print, Highland Park, New Jersey, Gryphon Press, 1961, pages 336-338.

[2] Ibid., page 153.

The question remains. "What instruments should we use?" The dilemma faced by the researcher attempting to select among instruments may be illustrated with excerpts from a "hypothetical" faculty discussion.

> Clearly an acceptable instrument must provide a valid and unbiased assessment of an educational activity's effect on the knowledge or skills of those participating in it.
>
> Which knowledge or skills?
>
> The ones the activity is intended to influence: the knowledge and skills the instructor who designed the course intended it to influence.
>
> Who therefore must judge the validity and objectivity of the test?
>
> Clearly, the instructor.
>
> But the instructor claims it is impossible to develop tests that objectively measure the educational activity for which he is responsible.
>
> Well then it's impossible.
>
> Why do you want to develop more tests anyway?

The preceding may appear somewhat exaggerated. In fact, it differs from the dialogue encountered in the faculty discussions from which it was excerpted in only one important respect - its brevity.

If it is impossible to design an objective test (or to obtain agreement regarding an instrument), the researcher resigned to the unavoidability of subjective evaluation may be tempted to embrace the use of an "objective observer". This mechanism appears to offer an opportunity to obtain admit-

tedly subjective evaluation by one whose biases are totally independent of the specific situation to be observed. The "objective observer" may be therefore regarded as at least "impartially subjective".

Unfortunately, the views of the disinterested observer may fail to substantiate those of interested and influential participants in the activity. When this happens, the researcher quickly discovers that the very characteristics that made the impartial observer unbiased caused him to be "insensitive to important aspects of the process". In short, participants in the activity accuse the dispassionate observer of lacking sensitivity. What the researcher valued as "neutrality" is rejected by those involved in the process as "non-responsiveness".

The conclusion is inescapable. If those participating in the activity being studied must judge the observer's objectivity, objective personal assessment is an elusive research methodology.

The net effect of these deliberations was to expand the simple first exposure view illustrated in Figure 4.3 to the more realistically complex structure illustrated in Figure 4.5, page 4-40. This figure summarizes the major considerations influencing selection of the measurement procedures ultimately applied in this study.

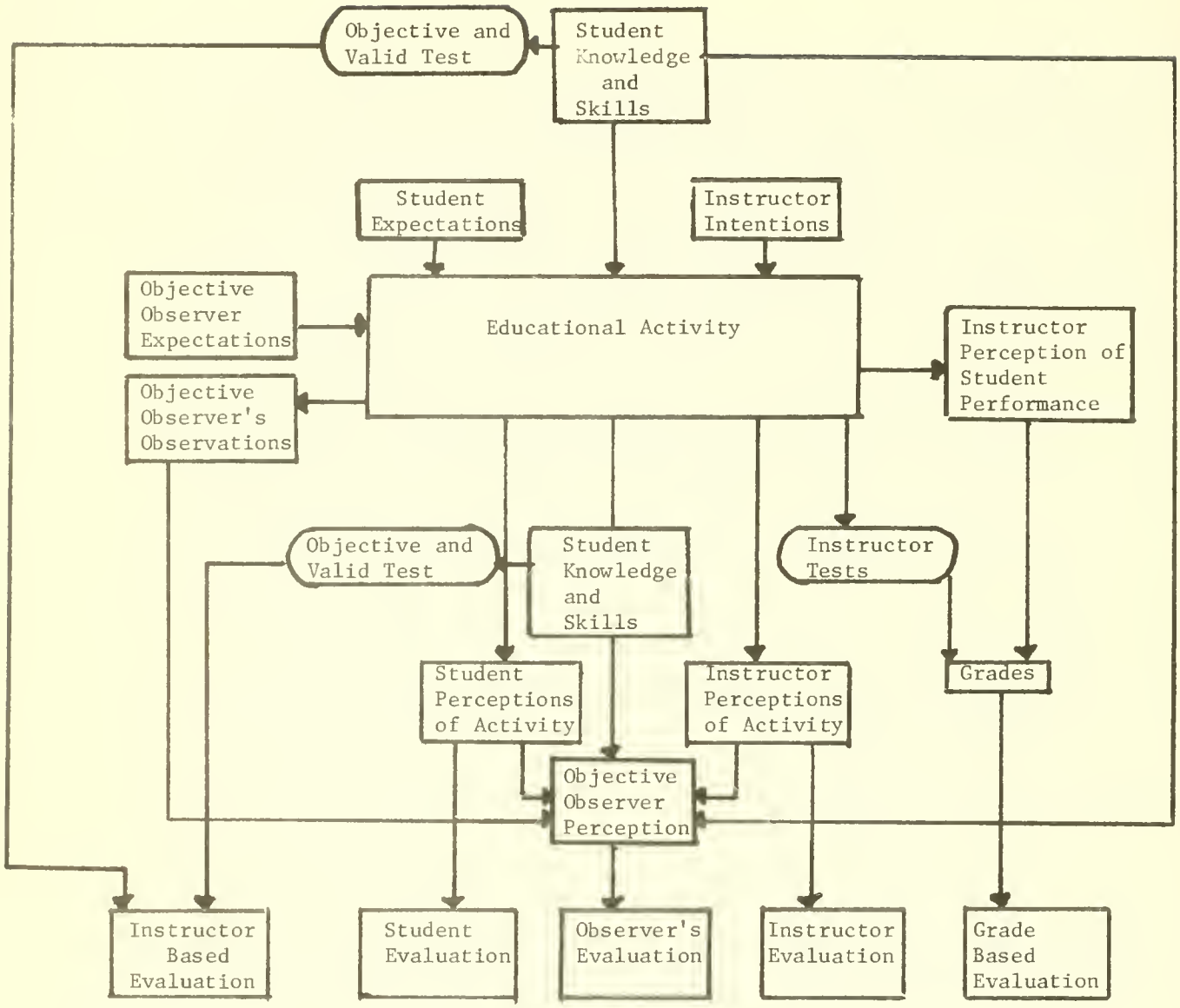

Figure 4.5 An Expanded View of the Educational Activity Measurement Problem

Student knowledge and skills before and after participation in an educational activity might be assessed in at least six different ways:

1. An objective instrument may be used to assess student knowledge and skills before and after participation in an educational activity. Acceptance of such an instrument is of course dependent on agreement regarding its objectivity, validity, and relevance.

2. Student performances may be evaluated on the basis of grades assigned by the instructor responsible for the activity. Grades may be based on either an instructor-developed test or the instructor's subjective assessment of student performance. Acceptance of this mechanism assumes that the instructor's tests or perceptions are valid, the instructor's criteria are relevant, and the grading procedures are reasonably accurate.

3. The instructor may be asked to evaluate the activity as opposed to the students and to report his perceptions of its impact on relevant knowledge and skills. Acceptance of this procedure is dependent on the belief that instructor perceptions are valid and that he is able to synthesize an acceptable overview.

4. An objective observer may examine the activity while it is in progress, assess student knowledge and skills before and after participation in the activity, and/or evaluate instructor and student perceptions of the activity. Acceptance of this methodology is conditional on agreement regarding the qualification, objectivity, and sensitivity of the observer as well as the accuracy and validity of the instrument he may use.

5. Student participants in the activity may be asked to evaluate the activity's impact on them. Acceptance of this methodology assumes that student perceptions are valid, that students are capable of recognizing changes in their own knowledge and skills, and that they are able to link specific changes to particular educational activities.

6. Alumni may be asked to evaluate educational activities in which they participated as students. Proponents of this methodology argue that measures of short term retention or perception are irrelevant.

The following comments made by George Stigler during a discussion of University level Economic Principles courses at the December 1962 AEA meet-

ing are indicative of the last point.

> "The student will memorize a few facts, diagrams, and policy recommendations, and ten years later will be as untutored...as the day he entered class...I propose the following test: Select an adequate sample of seniors (I would prefer men five years out of college), equally divided between those who have never had a course in economics and those who have had a conventional one-year course. Give them an examination on current economic problems, not on textbook questions. I predict they will not differ in their performance."[1]

Acceptance of this alternative assumes that all assertions regarding students under alternative 5 are equally applicable to graduates several years removed from the process. More important, it requires that activities in the current environment be related to those existing when alumni were attending classes. Acceptance of this condition is crucial since it is the basis of any action. Consider, for example, the procedure proposed by Stigler. It was implemented in a study by G. L. Bach and Phillip Saunders.

> "The objective of the study was to evaluate the economic knowledge of high school social studies teachers, all of whom were presumably responsible for teaching something about economics in their classes. The sample consisted of 4,000 teachers, from a total of about 65,000 high school social studies teachers, each of whom took the TEU. It was possible to hold constant through multiple regression analysis such variables as sex, age, years away from the last course in economics, and standing in college class, and to compare the scores of teachers who had, and had not, taken college courses in economics.
>
> The result was clear. There was no significant difference between those who had no college economics and those who had a semester or full-year course. A difference was barely visible for teachers with two full years of college economics. Only for those teachers with at least five semester courses was there a substantial, statistically significant difference in performance. As measured by the TEU, the Bach and Saunders results firmly support the unpleasant conclusion that, for all

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[1] Keith G. Lumsden, "Where We Now Stand," Journal of Economic Education, Fall, 1969, Vol. 1, No. 1, p. 14.

> types of colleges and universities, elementary economics courses have not had any lasting effect even on a group which ought to be using economics in its day-to-day teaching of social studies in the high schools."[1]

Now what? Did the faculty agree before the fact that current practices are comparable to those represented when those tested studied economics? If not, they can dismiss the findings as interesting but inapplicable. After all, these results relate to courses taught by earlier faculties. Current courses? Well, that is another issue.

It is important to recognize that alternative 6 implies normative evaluation in light of later experience whereas alternatives 1 through 5 are concerned only with descriptive reporting of events as they occur (or are perceived). In this context it is also significant to note that our current concern is measurement, not evaluation. Our objective at this stage is to establish measures through which information describing each part of the educational process can be obtained.

Selecting a Measurement Procedure

None of the six alternatives is ideal. After considering each type of measurement, procedures combining alternatives 3 and 5 were implemented. This selection resulted from pragmatic minimization of objections as much as theoretical maximization of benefits.

Instrument based evaluation was rejected after more than a year of investigation. It was apparent that no reasonable combination of instruments could provide the breadth, sensitivity, and depth demanded by the faculty. In addition, many faculty members objected to the idea of

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[1] Ibid, p. 14.

"externally designed tests being imposed." They were not positively predisposed toward arbitrary, time consuming, useless, outside interference in their courses.

Some faculty members strongly supported initiation of research designed to develop a truly objective and generally applicable instrument that could be applied in later years. It is somewhat disappointing to note that their enthusiasm wained markedly when they discovered that resources to support this basic research would not be generated by disbanding this "applied" study.

Grade based evaluation was discarded when preliminary analysis revealed that faculty and student responses to this methodology could be fully displayed on a scale ranging from "totally meaningless" to "marginally relevant."

Use of objective observers was abandoned since student and faculty agreement with some observer perceptions was not sufficient to overcome strong negative reactions engendered when major differences occurred. Students and faculty exhibited remarkable agility in focusing on points of disagreement with the observers despite the fact that each group focused on different points, and perceptions rejected by one group were frequently accepted by the other.

The alternative of examining educational activities through the eyes of student and faculty participants offered several compelling advantages. First, it provided an opportunity to obtain data from "observers" who were exposed to every facet of the activity. Second, the presence of multiple student observers in each activity provided many observerations of the same process providing a basis for stability and variance assessment. Third, given access to student perceptions, it was possible to refine the

required subjective student responses (e.g., changes in self image). Fourth, by obtaining data from both students and instructors before and after the activity, it became possible to isolate and examine the effects of student expectation and instructor intentions.

Instructor intentions prior to teaching a course were measured using the instructor Pre-Course Questionnaire presented in the Appendix. Measures obtained using this instrument provided the data summarized in Table 4.8. A student Pre-Course Questionnaire designed to obtain student expectations regarding course content and methodology was used during early stages of this research. Its use was discontinued after preliminary analysis indicated that course specific expectation data added little to the expectation information obtained from the Pre-Term Questionnaire responses summarized in Table 4.5.

At the conclusion of each course studied the instructor was asked to describe what had happened in the course using the learning outcome and learning mechanism dimensions applied in the Pre-Course Questionnaire. In this Post-Course Questionnaire the instructor was also asked to describe his use of technological aids (slides or films, video tape, etc.) in the course just completed.

Students enrolled in each course were asked to describe its impact along the learning outcome dimensions used on the Professor Pre and Post Course Questionnaires. Students were also asked to describe the nature of student/professor interactions during the course. The student Course Evaluation Questionnaire was used to obtain information about the structure of the course and the students' perception of the relative quality of course content and methodology. Finally, each student was asked to "describe the professor" in the course using the semantic differential "adjective" sets

employed in the Pre-Program Questionnaires to assess student perceptions of self, ideal self, and the typical manager.

The instructor Pre-Course Questionnaire, Instructor Post Course Questionnaire, and Student Course Evaluation Questionnaire are presented in the Appendix. The content of the Instructor Pre-Course Questionnaire was summarized earlier in Table 4.8. The Instructor and Student Post Course Questionnaires are reviewed in Table 4.9.

Table 4.9 Post Course Measurement

Measurements taken at the conclusion of each course focused on the perceptions of the instructor and the students involved in the course.

Through the Professor Post Course Questionnaire each faculty member was asked to specify his impressions of the course in terms of:

1. The extent to which he emphasized specific learning outcomes (e.g., application of techniques, policy formation, and planning)
2. The relative emphasis given specific learning mechanisms (e.g., case studies, projects in industry, and class discussions)
3. The portion of course content determined by student interest
4. The extent to which specific technological aids (e.g., slides or films, video tape, etc.) had been used and the purpose for which these facilities had been employed (e.g., as lecture supplement, as a basis for discussion, etc.)

Students taking the course were asked to describe their perceptions of:

1. The change along the various learning outcome dimensions experienced as a result of the course
2. Student-instructor interaction within the course and specific characteristics of the course[1]

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[1] Classroom environment variables were obtained from Fleishman's Leadership Opinion Questionnaire and translated into classroom relevant terms by Douglas T. Hall and Edgar Schein. Another study using similar variables is "The Effect of Student Teacher Congruence upon Student Learning", Douglas T. Hall, Yale University, paper delivered at the annual meeting of the American Educational Research Association, Chicago, February 10, 1968.

[continued on next page]

3. The relative work-load, scope, depth, and timeliness of material covered in the course
4. The quality of text materials and assigned readings
5. The instructor in the course described along selected adjective scales (e.g., relaxed/anxious, competitive/non-competitive, efficient/inefficient, etc.)

Graduate Attributes

After the educational process has functioned for an appropriate period of time, each program participant graduates or is otherwise expunged. At this point the educational manager's concern is with the product quality (or customer satisfaction) produced by his program. Advocates of the production model of education are interested in the changes in knowledge, skills, attitudes, or values produced by their facilities. The marketers, on the other hand, are primarily concerned with their clientele's satisfaction with their scholarly shopping spree.

Measures obtained at this stage in the study were designed to provide information of the type desired by both classes of manager.

Considerations paralleling those previously discussed in conjunction with the educational process motivated direct measurement of student and faculty perceptions of program impact. Faculty assessment focused on the twenty-one learning outcome dimensions. Measures obtained from student participants included overall reactions to the program per se and perceived program impact.

Graduate "brand image" data obtained at the conclusion of the program

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Regarding Fleishman's Leadership Opinion Questionnaire, Wayne Kirchner (Manager for Personnel Research for the Minnesota Mining & Manufacturing Co., St. Paul) presents the following review in Buros, Tests in Print, p. 1372. "It (the instrument) has been developed through careful research, and careful statistical techniques. It appears to be reliable, presents good evidence of validity, and presents reasonably good norms. It seems well suited for research activities and training activities, although it is probably not the best thing to use as an evaluative instrument of supervisory performance."

included certainty about entering the institution, retrospective reasons for pursuing graduate study, and perceived strengths and weaknesses of the institution. Student evaluations of program impact focused on perceived changes along the learning outcome dimensions as well as direct measurement of terminal career objectives, self perceptions, and personal opinions.

The post-term questionnaire used to obtain these data is reproduced in the Appendix. The content of this questionnaire is summarized in Table 4.10.

Table 4.10 Student Attributes Measured at End of Year

The following information was obtained using the graduate post-term questionnaire booklet contained in the Appendix.

1. Graduate and undergraduate specialization
2. Plans for further graduate study
3. Reasons for pursuing graduate study
4. Perceived strengths and weaknesses of institution attended
5. Perceptions of the extent to which specific learning methods contributed to career objectives
6. Perceived change along learning outcome dimensions
7. Career and salary objectives for first job and after twenty years
8. Relative importance attached to specified job characteristics
9. Current self perception
10. Perception of ideal self
11. Perception of a typical businessman
12. Personal opinions regarding various aspects of business management

Questions on the Graduate Post-Term Questionnaire duplicate those in the Entering Student Questionnaire described in Table 4.5.

The Measurement Process

Managerial concern with the effects of the measurement process is two-fold: first to assess the impact of measurement procedures on the educational process and, second, to avoid adverse reactions from students and faculty involved in the program. These concerns lead, in turn, to numerous

questions. Does the presence of questionnaires sensitize students and faculty to selected program attributes? Will faculty members attribute Machiavellian intent to administration sponsorship of internally focused research and equate measurement with surveillance? Will the presence of formalized student assessment foster demands for action to redress situations reported as unsatisfactory? Our ability to answer these questions is limited at best.

It is difficult to assess the impact of a measurement procedure without introducing additional measurement procedures. And the additional procedures may alter the influence of the initial measurements or affect the process measured by the initial measurements. The characteristics of this problem bring to mind an involuted illustration of a man looking at a picture of himself looking at a picture of himself looking at a picture... It is all but impossible to establish an effective control (reference) for use in this context. It is difficult to measure conditions where no measurement procedures are present.

Our approach to this situation was twofold. First, student and faculty members were asked about their reactions to the questionnaires and associated measurement procedures in interview situations. Second, returned questionnaires were examined for explicit (e.g., written comments) and implicit (e.g., non-completion) indication of dissatisfaction. Information obtained from these sources is discussed in Chapter 14.

Program Evaluation

Program Evaluation is the point in the educational process where the

most explicit ramifications of a more systematic approach to the management of education should be encountered. The managerial objectives associated with program evaluation are directly related to the primary motivations for this study. We believe that any explicit framework and process oriented measures can provide a basis for more effective and rational program planning and control.

Program evaluation can be the central mechanism through which the manager maintains stability and commitment to primary goals while responding to legitimate interest groups within the university community and society at large. A framework and measures of the type discussed in this study have the potential to reduce the response time associated with program modification and increase the efficiency with which resources are devoted to course development. They should also help the manager maintain a stable operating environment through explicit goal formulation and on-going monitoring of educational activities and the results they produce.

These assertions are the subject of concluding chapters. However, they strongly influenced research objectives. Specifically, these interests caused us to be concerned with inputs to the program evaluation process, the factors to which the process was sensitive, responses to specific stimuli, and the response time of existing procedures.

Measurement requirements generated by these interests and needs focused on two types of data. The first involved content analysis of course and program descriptions in an effort to determine the extent to which explicit criteria could be employed in the program evaluation process. The second class of measures was concerned with the frequency, extent, and content of feedback from the program evaluation process to those concerned with on-going activities.

Measurement Timetable

The timing of questionnaire distribution was an important part of the research design. Considerations included the most convenient time to reach subjects, the time when students would be most responsive to questionnaires, and, of course, the requirement that certain questions be asked at particular points in the educational process.

A timetable for the undergraduate study designed to measure gross changes over a one year period was relatively simple. Questionnaires had to be distributed to undergraduates at the beginning and end of the school year. Compatibility between undergraduate and graduate measures was insured by maintaining comparable time schedules for both groups. The Undergraduate Pre-Term and End of Year Questionnaires were slightly modified versions of the Graduate Pre-Term and End of Year Questionnaires.

The timing of graduate questionnaire distribution was somewhat more complex due to the number of questionnaires involved in the learning process study and the relationships between the various types of questionnaires. After experimenting with various alternatives, we decided to distribute questionnaires to all students at logical breaking points in the learning process - the beginning and end of year and at the termination of each course - rather than staggering course specific questionnaire distribution over the year. Students appeared to be more willing and to have more time to answer questions in these more relaxed transition periods. The comprehensive change oriented questionnaires (The Pre-Term and End of Year Questionnaires) obviously had to be completed at the beginning and end of the academic year. Students at two participating institutions were also asked to fill out an Allport Vernon Lindzey Study of Values Test at the beginning of the fall term. In addition to these overall program measurements, students were

asked to complete course evaluation questionnaires during the last week of classes in each course studied. (Two of the participating schools operated on a term schedule; the rest on semesters).

Additional data regarding facilities, class and program enrollment, student/faculty ratios, requirements and pre-requisites, admissions statistics[1] and other aspects of program operations were provided by the administrations and school catalogues of cooperating institutions.

Faculty member objectives and perceptions were assessed through the Professor Pre Course and Post Course Questionnaires administered at the outset and completion of each course respectively. Faculty data were limited to these measures of student related interactions since students are the focal point of the study. Table 4.11, pages 4-53 to 4-55, summarizes the administration schedule and focus of these questionnaires.

Inter-Questionnaire's Linkages

Measurement of change obviously necessitates repeated application of the same questions on comparable instruments over time. Figure 4.6, page 4-56, shows the linkages among common items in the questionnaires administered to students and faculty at different points in time. Only items appearing in two or more questionnaires are noted in this figure. Responses to these common items provide the data for comparative studies of faculty and student expectations and perceptions of the learning process, anticipated and realized learning outcomes, and course specific activities. Changes in student perceptions of their graduate school (actually perceived strengths and weaknesses of the school) as well as changes in career expectations,

[1] The admissions data was gathered only at the Sloan School.

Table 4.11 Administration Schedule and Focus of Questionnaires

Student Questionnaires

Questionnaire	Distributed	Questionnaire Content
Pre-Term Questionnaire	Beginning of academic year	. Demographics -Background information . Educational Expectations -Field of specialization -Reasons for attending graduate school -Learning mechanisms expected to contribute to career objectives -Expected changes in self in managerial skills-learning outcomes . Career expectations -Expected type of job, employer and salary after graduation and in twenty years. -Preferred working conditions . Semantic differential items used to describe the self, the ideal self and a typical manager . Personal Opinion Questionnaire -Attitudes toward business
Allport Vernon Lindzey Study of Values*	Beginning of academic year	. Rating of student values in 6 areas: Theoretical, Economic, Social, Aesthetic, Political and Religious

*Standardized test published by McGraw-Hill, New York.

Table 4.11 (Continued)

Questionnaire	Distributed	Questionnaire Content
Course Evaluation Questionnaire	Conclusion of each course	. Perceptions of changes in managerial skills-learning outcomes . Student perceptions of course and faculty . Time spent on course, comments about text, class size, etc. . Semantic differential description of perceived faculty personality traits . Additional comments and suggestions (separate sheet) for open-ended remarks about course.
End of Year Questionnaire	End of academic year	. A past tense version of the Pre-Term Questionnaire minus demographic items.

Table 4.11 (Continued)

Faculty Questionnaires

Questionnaire	Distributed	Questionnaire Content
Professor Pre-Course Questionnaire	Beginning of each course	. Description of intended course content, emphasis upon subject matter . Expected impact of course upon students' managerial skills-learning outcomes . Learning mechanisms to be employed in teaching - Methodology and learning aids . Portion of course to be determined by students. Expected time required of students taking course
Professor Post-Course Questionnaire	Conclusion of each course	. Perception of course impact on student learning outcomes . Actual learning mechanisms employed . Actual portion of course determined by students

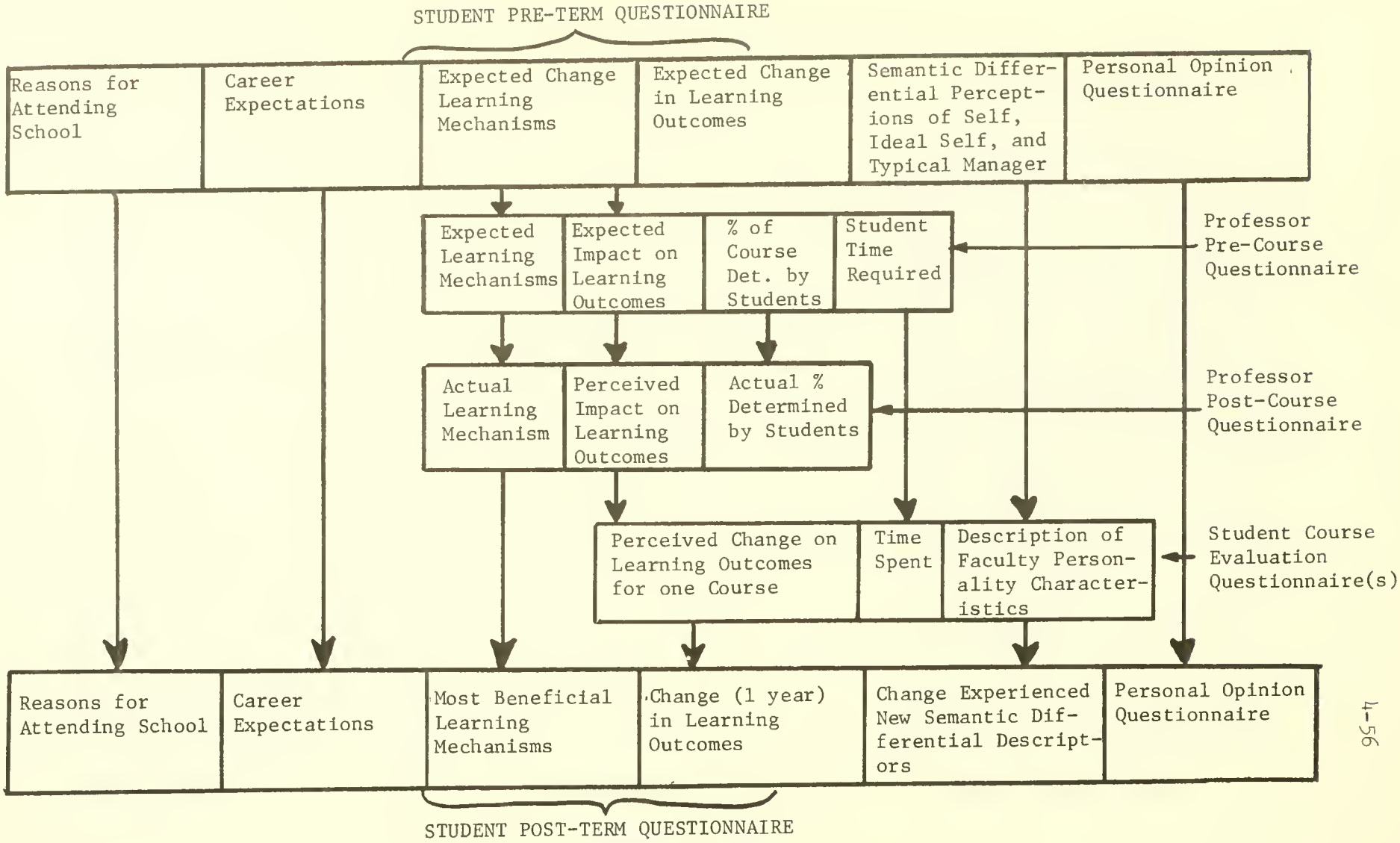
STUDENT PRE-TERM QUESTIONNAIRE
Reasons for Attending School
Career Expectations
Expected Change Learning Mechanisms
Expected Change in Learning Outcomes
Semantic Differential Perceptions of Self, Ideal Self, and Typical Manager
Personal Opinion Questionnaire
Expected Learning Mechanisms
Expected Impact on Learning Outcomes
% of Course Det. by Students
Student Time Required
Professor Pre-Course Questionnaire
Actual Learning Mechanism
Perceived Impact on Learning Outcomes
Actual % Determined by Students
Professor Post-Course Questionnaire
Perceived Change on Learning Outcomes for one Course
Time Spent
Description of Faculty Personality Characteristics
Student Course Evaluation Questionnaire(s)
Reasons for Attending School
Career Expectations
Most Beneficial Learning Mechanisms
Change (1 year) in Learning Outcomes
Change Experienced New Semantic Differential Descriptors
Personal Opinion Questionnaire
STUDENT POST-TERM QUESTIONNAIRE

Figure 4.6 Questionnaire Linkages Between Data Subsets

perceptions of self, ideal self and a typical manager, and changes in attitudes and opinions were measured by comparing responses to comparable questions asked at the beginning and end of the year.

Pre- and Post-Term student semantic differential perceptions and course specific perceptions of faculty personality characteristics are shown as common items in Figure 4.7. The questions posed in these instances are different, ("Describe you as you see yourself", "You as you would like to be" - ideal self, and "A typical manager" in the student Pre- and Post-Term Questionnaire and "Describe the faculty member in this course" in the Course Evaluation Instrument.) However the same set of descriptive adjective pairs is used in all cases. This commonality was employed to permit changes in student perceptions of self, ideal self and typical manager to be compared with student perceptions of particular faculty members.

Intended and perceived changes in learning outcomes (student managerial skills) are traced throughout all questionnaires. This is appropriate since the learning outcome dimensions are an integral part of the framework linking student and faculty perceptions, program objectives, course planning and evaluation and resource allocation.

Linkages between Professor Pre- and Post Course Questionnaires and Student Course Evaluation forms provide multiple perceptions of course content, methodology and impact. The researcher can thus compare prior faculty expectations and program objectives with faculty perceived outcomes to determine if the faculty member perceives that he achieved his (and/or administrative) objectives. Student and faculty evaluations of the same course can also be compared to determine the congruity or divergence of student and faculty perceptions.

Summary

This chapter has described factors influencing the selection and implementation of measures and measurement procedures in this study. Our objective was to review the process through which we attempted to fathom the behavior of those "...marvelous, vain, fickle and unstable subjects" (including the authors) who inhabit the world of graduate management education.

Table 4.12 provides a reasonably concise summary of the managerial objectives and resulting measures associated with each measurement point in the educational process flow charts presented in Figures 4.1 and 4.2. It is hoped that these three displays will help the reader integrate the material presented in this section.

Table 4.12 Summary of Management Objectives and Associated Measurement

Educational Process	Measurement Objective	Measures Obtained
Institutional Communication	-Establish relative importance of institutional communication in formation of student image of institution	-Student description of selection process
	-Determine relation between current student perceptions and extent of institution communications	-Student perceptions of institutions -Catalogue content coding
Attributes-Potential Applicant	-Establish the attributes and perceived qualifications of potential applicants to Graduate Management Programs -Determine relation between undergraduate institutions and selected applicant attributes	-Potential applicant demographics, educational expectations, attitudes toward graduate study, career objectives, self perceptions, ideals, perceptions of "typical businessman" and opinions re management.
Applicant Attributes	-Establish the attributes and qualifications of applicants to graduate management programs -Determine differences, if any, between those interested in management and other professions	-Measures obtained for potential applicants -Applicant undergraduate grade point average, undergraduate institution "quality", adjustment, courses taken, undergraduate activities, experience ATGSB scores, and qualitative coding of letters of recommendation and plan
Admission Procedure	-Establish nature of admission process information available and used -Determine results of process-differences between accepted and rejected applicants	-Measures obtained for applicants -Process description -Measures used in process -Applicant classification

Table 4.12 Summary of Management Objectives and Associated Measurement (Continued)

Educational Process	Management Objective	Measures Obtained
Accepted Applicants Decision to Attend	-Establish the attractions and qualifications of non-attenders -Determine if particular perceptions of the institution are associated with non-attendance	-Measures obtained for applicant -Applicant's decision outcome
Entering Student Attributes	-Establish attributes and qualifications of those entering our program -Determine differences, if any, between those entering our program and those attending other comprable programs	-Entering student demographics, educational experience and expectations, certainty about program and institution, career objectives, self perceptions, ideal perceptions of "typical businessman" and opinions re management.
Orientation Process	-Determine changes in educational expectations and institutional images resulting from orientation program -Determine impact of orientation on program impact and student satisfaction	-Changes in educational expectations -Changes in certainty about decision to enter program and choice of institution.
Program and Course Objective Formulation	-Develop explicit framework for defining course and program objectives -Use framework to establish objectives and evaluate results achieved	-"Learning Outcomes" desired by program planners -Course specific impact objectives

Table 4.12 Summary of Management Objectives and Associated Measurement (Continued)

Educational Process	Measurement Objective	Measures Obtained
Course Planning and Development	-Establish generally applicable measures of course content, format and methodology -Develop a categorization scheme for identifying similar types of courses	Instructor plans for courses including -Underlying discipline -Course focus -Desired learning outcomes -Intended learning mechanisms -Course structure
Educational Activities	-Establish measures of educational activity and student change -Determine nature and extent of change occuring in courses and program -Link specific educational activities to "learning outcome" associated changes	-Pre-course assessment using Course planning and development measures -Post course assessment of -Professor perceptions of learning outcomes, learning mechanisms and course structure -Student perceptions of learning outcomes, student/instructor interaction, course structure and quality, and instructor characteristics
Graduate Attributes	-Evaluate the cumulative impact of all program elements -Determine characteristics of program graduates	-Faculty perceptions of program impact along learning outcome dimensions -Student field of specialization, interest in advanced study, reasons for graduate study, evaluation of institution, perceived changes in self along learning outcome dimensions, career objectives, perceptions of ideal self, real self, typical businessman, managerial opinions

Table 4.12 Summary of Management Objectives and Associated Measurement (Continued)

Educational Process	Measurement Objective	Measures Obtained
Measurement Process	-Evaluate impact of measurement process on educational program and program participants	-Direct questioning of students and faculty members -Examination of explicit remarks and response statistics
Program Evaluation	-Determine system impact on nature and extent of planning model -Evaluate quality, extent and response time of program modification	-Content analysis of course and program description -Frequency, extent and content of feedback from administration to instructors

Chapter 5

The Data Base and Data Structures

> "Don't tell me of facts, I never believe facts; you know Canning said nothing was so fallacious as facts, except figures."[1]

The conceptual frameworks and measurement procedures underlying this study of university level management education were described in Chapters 3 and 4 respectively. It is now time to face the practical problems of applying these structures in the "real world" -- problems of data collection, file design and analysis.

This chapter summarizes the steps taken and difficulties encountered when contacting and obtaining data from respondents at each university included in the study. It also describes the data analysis and reduction techniques as well as the statistical methods used to develop the information presented in the following chapters.

Topics to be covered range from descriptions of respondent attributes to the interpretation of discriminant analysis output. The intent of this wide ranging discussion is to acquaint you with the content and structure of the data base and the statistical tools used in later analyses.

We shall begin by reviewing the selection process through which undergraduate and graduate schools were chosen for inclusion in the sample, and the distribution procedures that determined which students and faculty members at these institutions received questionnaires. Factors affecting response rates will also be examined in this section.

The next topic to be considered is the information system used to organize and relate responses from students and faculty at each school. While there is no point in belaboring technical details, it will be useful for you to have a general "feel" for the file creation and retrieval structures through which data were accessed and combined.

The third major section of this chapter is concerned with the reasoning

[1]Sydney Smith, Lady Holland's Memoir, Vol. I, Chapter 11.

followed when subdividing questionnaire content into logical units for analysis. This section also describes the statistical techniques applied to these questionnaire subsets. Finally the derived measures or "factors" produced by the data reduction p ocess are presented and interpreted. While you are not expected to be intimately concerned with the details of factor analysis we do hope that you will gain a general understanding of the factor structure described in this chapter since much of the analysis in later chapters is based on this technique.

The overall objective of this exposition is to answer the 'who', 'what', 'why', and 'how' questions that arise when data are collected and applied to a theoretical framework. Technicalities are not important. At the end of this chapter you should know: who responded to which questionnaires; how the information was structured, stored and retrieved; what statistical procedures were applied to which questionnaire subsets, and why; and what factors emerged when individual responses were combined.

Sample Selection

The process model structure developed in Chapter 4 describes an on-going process that might be studied most logically by examining student actions, responses, and decisions over time. Unfortunately such an over-time analysis would encompass many years, and budgetary constraints limited measurement to a single twelve month period. Data collection was therefore divided into discrete undergraduate and graduate segments. Due to the relative size of the groups studied, samples were drawn from the undergraduate populations while, with one exception, questionnaires were distributed to the entire student population at participating graduate schools.

Since the study was concerned with undergraduate attitudes toward management and the graduate business education process, data were obtained from a cross section of undergraduate institutions that were willing to have their students' responses sampled and a set of graduate schools of business that were

be willing to participate in a much more comprehensive and demanding measurement schedule.

The selection process was subject to three additional constraints. First, the Carnegie Commission was preparing an extensive set of educational profiles and requested that our undergraduate sample include certain institutional types:

> "service oriented professional schools, liberal arts colleges in universities, independent liberal arts colleges, state colleges, junior colleges, invisible colleges (schools with a strong following of alumni which are not nationally famous), Catholic colleges and universities, independent research institutes, and educational programs in military and industry."

Wide geographical distribution was also recommended. Some of these categories were eliminated as inappropriate given our concern with undergraduate institutions that might produce students who would enter Graduate Schools of Business. However, the Carnegie classification scheme strongly influenced the selection of undergraduate institutions.[1]

A second and inevitable constraint was limited finances and the related need to reconcile time, costs, efficiency and manpower. Exporting questionnaires and manpower to achieve wide geographical distribution greatly increases costs and decreases efficiency. In this respect, our Cambridge location was extremely advantageous due to the large number of Universities in the Greater

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[1] Alexander Astin in an American Council on Education study suggested a classification scheme that also influenced our thinking. "Institutions have first been sorted into four broad strata: universities, 4-year colleges, 2-year colleges and predominantly Negro colleges. The 4-year colleges have been further separated into public, private-nonsectarian, Catholic and Protestant. Within each of these administrative types, institutions have been further stratified into terms of a variable called "selectivity" which represents an estimate of the average academic ability of the entering students. Since this estimate was not available in many of the two-year institutions, some of these were subdivided on the basis of another measure of institutional quality: the pre-student expenditures for educational and general purposes, which we have called "affluence". Alexander W. Astin, "Personal and Environmental Determinants of Student Activism" paper presented at the APA meeting in San Francisco, California, August 30, 1968.

Boston area.[1] While cost considerations motivated us to confine our study to schools near Boston, the need for demographic distributions dictated three exceptions to this New England orientation. Stanford University and Southern Methodist University contributed data to the graduate business portion of the study, while Southern Methodist University and Muskingum College (in Ohio) participated in the undergraduate survey.

The third constraint was that the institution be willing to commit faculty and/or administration support and cooperation (meaning time) to the project. Willing subjects were not easily acquired in the spring and summer of 1969. Administrators expressed concern over student sensitivity to questionnaires and "data banks".[2] In some institutions faculty and administration representatives shared (or created) student hostility toward information gathering. In each of the institutions that ultimately contributed to this research there was at least one enthusiastic faculty member or administrator willing to devote time and effort to questionnaire distribution.

Undergraduate institutions ultimately participating in the study were: Boston College (Boston, Mass.), Brandeis University (Waltham, Mass.), Dartmouth College (Hanover, New Hampshire), Northeastern University (Boston, Mass.), Muskingum College (New Concord, Ohio), Southern Methodist University (Dallas, Texas) and Wellesley College (Wellesley, Mass.).

Pre-term questionnaires, described in Chapter 4, and reproduced in toto in the Appendix, were distributed to samples drawn from students at these institutions in the fall. A similar end-of-year questionnaire was distributed in the spring at the end of the academic year.

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[1] The Greater Boston Chamber of Commerce lists "56 institutions of higher education in the Greater Boston Area alone and approximately 115,000 students attending regularly," (Source: Miss Condrick of the Greater Boston Chamber of Commerce.)

[2] See student comments in Chapter 14.

Five graduate schools of business provided data for the more complex study of the graduate education process. These were: Boston College, Amos Tuck School of Business Administration at Dartmouth, The Sloan School of Management (M.I.T.), Southern Methodist University (in Texas) and two sections of students from the entering class at Stanford.[1]

Students and faculty at participating graduate schools were given the three types of questionnaires described in Chapter 4 : (1) Student Pre and Post term questionnaires distributed at the beginning and end of the academic year; (2) Student course evaluation forms filled out at the completion of each course; and (3) Faculty questionnaires completed prior to and at the termination of each course.

Undergraduate Sample Selection and Questionnaire Distribution

The study of undergraduate attitude formation required samples from all four classes of the undergraduate school populations. Procedures followed differed from school to school. The Boston College administration selected students randomly and handled questionnaire distribution. Students samples from Brandeis, Dartmouth, Northeastern and Wellesley were chosen by matching a list of names provided by the school with a randomly generated sequence of numbers.

Brandeis students received the questionnaire in their student mail folders while Dartmouth and Wellesley questionnaires were delivered to students in their dormitories. Students at Northeastern, primarily a non-resident city school, were mailed questionnaires at their home addresses. Southern Methodist University distributed the questionnaire to all of their undergraduate business students in conjunction with a larger comprehensive study they were conducting. Muskingum College included the questionnaire in their freshman orientation examination schedule - thereby reaching the complete population of their in-

[1] Only two masters sections could be sampled at Stanford since other sections were participating in other studies.

coming freshman class but excluding the upper classes. As these comments suggest, sample sizes and modes of distribution varied according to the requirements imposed by each school. In general, our interest in obtaining a cross section of the students attending undergraduate institutions was reasonably served by the various distribution procedures.

Graduate Questionnaire Distribution

Each graduate school of business distributed questionnaires directly to students and faculty in their Master's program. Stanford, as mentioned earlier, obtained data from students in two first year Master's sections and from the faculty teaching these sections.

In addition to the major questionnaires, a number of smaller, narrowly focused studies involved additional data collection. Research focusing on sensitive (and closely guarded) information, such as the detailed examination of the graduate admissions process, was, of necessity, confined to our parent institution, the M.I.T. Sloan School of Management.

Questionnaire Returns - Response Rates

Acceptable response rates were obtained for both undergraduate and graduate schools in the fall of 1969. During the spring of 1970, however, questionnaire distribution and data collection were severely hampered by the nationwide student strikes that followed the invasion of Cambodia and the deaths of students at Kent State and Jackson State. Many students left campus to protest and participate in political actions and a number of universities were shut down altogether. Data collection during this period was erratic at best. Response rates were inversely proportional to the degree of stress and involvement at each school. In general, the private institutions involved in our study, particularly those located in the Northeast, were most affected and subsequently exhibited the poorest end-of-year response rates.

The following excerpts from Richard Peterson and John Biloursky's study of the aftermath of Cambodia and Kent State indicate that our predicament was far from unique.[1]

> Campus turmoil is almost certainly not solely a thing of the past. But the climax of dissent, disruption, and tragedy in all American history to date occurred in May 1970. That month saw the involvement of students and institutions in protests in greater number than ever before in history. The variety of protest activities-both violent and nonviolent-seemed to exhaust the entire known repertoire of forms of dissent.

In this study, Richard Peterson sent questionnaires to the presidents of 2,551 colleges and universities to determine exactly what happened, and what impacts the events of this critical month are likely to have. He received a remarkable 73 percent response. A generalized summary of his findings is in the table below:

Intensity of the Spring 1970 Upheaval in Various Types of Colleges [1]

	N	*Student/ staff strike: one day or longer*	*Student efforts to communicate with local people about the war*	*Essentially peaceful demonstrations*	*Demonstrations damaging persons or property*
Type and Level of Institution					
Independent universities	37	41%	89%	89%	16%
Public universities	114	28	71	76	28
Indep. 4-year colleges	198	27	61	62	3
Public 4-year colleges	255	13	45	54	5
Catholic institutions	227	10	37	41	2
Protestant institutions	338	7	35	38	1
Public junior colleges	477	8	27	32	1
Selectivity (4-year institutions only)					
Freshmen mostly from top 10% of H.S. class	135	35	80	79	9

(Table continued on page 5-8)

[1] Peterson, Richard E., and Biloursky, John A., May 1970: The Campus Aftermath of Cambodia and Kent State, A Technical Report sponsored by the Carnegie Commission on Higher Education (Berkeley, California, 1971).

Selectivity (4-year institutions only) continued					
Mostly from top 40%	598	16	53	58	6
Essentially open admissions	297	9	33	41	5
Enrollment					
More than 12,000	138	29	69	75	30
5,000 to 12,000	231	17	54	67	7
1,000 to 5,000	757	13	42	48	2
Less than 1,000	722	10	29	28	less than 1
Region					
Northeast	468	29	61	62	4
Pacific States	238	19	56	54	5
Midwest	621	12	34	39	4.5
Mountain States	82	7	30	39	4
Southeast	445	7	20	29	2
"Federal Grant Universities"	49	33	84	84	31

The following excerpt from a note penned in June 1970 by the harried Dean of a graduate school participating in our study illustrates the personal meaning of these statistics.

> "By bad luck I was out of town most of the last week...and we didn't turn around fast enough [to distribute the questionnaire]. Our Assistant Dean is collecting the summer addresses of the people whom we polled last fall. I will forward them to you as soon as I receive them--probably within the next few days.
>
> I'm sorry for all of the foul-up connected with this at our end. These have been hectic times, and we simply have not been able to maintain all our commitments."

The Implications of Non-Response

One objective of this research effort was to obtain valid and representative measures of relevant educational activities. Obviously, the most pressing concern associated with non-response is bias introduced by examining only the responses of those whose attitudes and values predisposed them to participate in the study. It is theoretically possible to eliminate non-response by requiring students and faculty to fill out questionnaires. However this option is neither practical nor desirable in the real world context of this study. Such forced response, if logistically obtainable could introduce even greater attitudinal biases than non-response - "you can lead a horse to water..."

It is not our intention to engage in a lengthy discussion of sampling theory.[1] The pragmatic questions are, how bad is the problem and what can we do with the data we have?

Undergraduate Response Rates

Overall undergraduate response percentages (Questionnaires returned

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[1] Readers interested in pursuing sampling theories are referred to Bernard Lazawitz' "Sampling Theory and Procedures" in Hubert M. Blalock and Ann B. Blalock, eds., Methodology in Social Research (New York: McGraw-Hill, 1968), pp. 278-328; Sampling Techniques, William L. Cochran, 2nd ed. (New York: Wiley, 1963) and Survey Sampling, Leslie Kish (New York: Wiley, 1965).

divided by questionnaires distributed[1]) were 45% for the fall 1969 Pre-Term questionnaire and 21% for the spring 1970 Post Term questionnaire. However these aggregate measures can be misleading. Table 5.1 details the number of respondents per questionnaire for each school.

Table 5.1 Undergraduate Sample Sizes

School	Number of Respondents: Pre-Term Questionnaire Fall 1969	Number of Respondents: End-of-Year Questionnaire Spring 1970
Boston College	157	71
Brandeis	119	45
Dartmouth	238	-
Muskingum	462	355
Northeastern	163	85
S.M.U.	524	-
Wellesley	234	76
Total	1,897	632

The fall 1969 response rate varied by school from 20% to 95%. Further, the variation appears to be directly related to the mode of distribution: students who received questionnaires in their student folders or at their dormitories with introductory letters attached asking them to participate, responded at an average rate of 29%, while students who came into direct contact with individuals administering the questionnaire returned 89% of the forms.

The low spring response rate forced us to concentrate analysis on the fall data and severely hampered measurement of change from fall to spring.

[1]Because of varied questionnaire procedures, the response rates reported herein are estimates involving a conservative bias.

In some instances it was possible to do little more than test the relative stability of responses to various questionnaire items.

Graduate Response Rates

The fall 1969 overall Graduate Pre-Term questionnaire response rate of 73% dwindled to an End of Year spring 1970 questionnaire response rate of 30%. Both rates are computed on the basis of enrollment figures and data supplied by school administrators. Confusion in distribution record keeping at several schools precludes accurate computation of the exact numbers of questionnaires actually reaching students.

Data were obtained from faculty teaching courses in each of the major subject and discipline areas at each school. Again, the number of faculty members responding to the questionnaire was at its height in the fall 1969 with a total of 117 Pre-course Questionnaires received, and falling off during the winter and spring measurement periods. See Tables 5.2, page 5-12 and 5.3 page 5-13 for a summary.

The number of student course evaluation forms sent to administrators each semester or term was based upon a simple formula applicable to the M.I.T. Sloan School: five times the number of students equalled the number of forms sent. Differences in distribution and collection procedures within and among schools preclude computation of an accurate course evaluation response rate. We received an overall average of 21 course evaluation responses per course studied.

Table 5.2 summarizes the response ratio for "useable data" collected during the fall of 1969 and the End of Year questionnaire responses obtained in the spring of 1970. Responses obtained using similar instruments during winter 1969-1970 and spring 1970 are summarized in Table 5.3. The low response levels indicated in this table precluded the use of these data in rigorous analysis.

Table 5.2

Graduate Questionnaire Responses - Useable Data

School	Pre-Term Questionnaire Fall 1969	Professor Pre-Course Questionnaire Fall 1969	Professor Post Course Questionnaire Fall 1969	Student Course Evaluation Questionnaire Fall 1969		End of Year Questionnaire Spring 1970
				Responses	Courses	
Amos Tuck	162	18	18	479	22	71
Boston College	189	32	25	565	27	69
Sloan	111	33	36	952	55	95
Southern Methodist	257	25	23	165	28	65
Stanford	64	9	7	357	10	30
Total	783	117	109	2,518	16	330

Table 5.3

Graduate Questionnaire Responses - Un-useable Data

School	Professor Pre-Course Winter [1] 1969-1970	Professor Post-Course Winter [1] 1969-1970	Student Course Evaluation Winter 1969-1970 Responses	Courses	Professor Pre-Course Spring 1970	Professor Post-Course Spring 1970	Student Course Evaluation Spring 1970 Responses	Courses
Amos Tuck	22	20	580	16	14	14	123	13
Boston College	-	-	-	-	-	12	-	-
Sloan	-	-	-	-	25	10	224	19
Southern Methodist	-	-	-	-	-	-	91	22
Stanford	-	-	-	-	-	-	-	-
Total	22	20	580	16	39	36	438	54

[1] Amos Tuck and Stanford operate on a term basis.

Data Utilization

The total number of responses received for the undergraduate samples (1,897 Pre-Term Questionnaires) provided an adequate cross section of the population being studied and a satisfactorily representative indication of undergraduate attitudes toward business.

The fall and winter questionnaire distribution to the graduate business school population (faculty and student) produced acceptable response rates from this group. Since the spring distribution was much less satisfactory, the major portion of our analyses of the overall graduate business population is based on the fall and winter questionnaires. These data provide the input to all of our "macro" studies such as the analysis of similarities and differences among graduate schools. The more detailed "micro" examinations of determinants of student change depend heavily on measurements obtained at the Sloan School during the 1969 academic year.

Measuring Change and the Problem of Non Response[1]

Studies of student perceived change over time require linkages between individual responses at different points in time. Such linkages cannot be established if the set of students who respond differs and/or the identification codes used to establish linkages (in our case student identification numbers) are forgotten, incorrectly stated, shuffled, or changed. The latter problem can be dealt with by editing, checking and re-checking identification procedures. Actual changes in the individuals responding is another matter.

Our objective was to maximize the number of fall responses that could be compared with spring questionnaires in order to study change attributable to the year's experiences. But, say only 60% of the fall respondents can be matched with those returning questionnaires in the spring. The remaining 40% undoubtedly includes some cases of bungled identification reporting or changed identification

[1]The following study was performed in order to justify the use of non-matching fall and spring questionnaire samples in the measurement of change. However, when the actual change analyses were performed (Chapter 9) only matching data were used in favor of conservative bias. However, methodological considerati tempt us to include the discussion at this point.

codes. However, it also contains some fall or spring non respondents. The question now becomes, can we legitimately compare all fall respondents to all spring respondents or must we limit our analysis to fall and spring respondents? In an attempt to answer this question we isolated three student groups:

1. Those who responded at both points in time (Responders),
2. Those who responded only in the fall (Fall Responders),
3. Those who responded only in the spring (Spring Responders).

Comparisons of data from Responders and Fall Responders as well as Responders and Spring Responders enabled us to determine if there were significant differences between these groups, and the nature of the bias that would be introduced by including partial non-responders in our analyses.

If significant differences were found, data from the partial non-responders had to be omitted. If no, or few, significant differences were evident it was reasonable to subject the total sample to further study.

Chi-square analysis was used to test for differences in the distributions generated by Responders and Fall Responders as well as Responders and Spring Responders. One hundred seventy three items from both the Pre Program (fall) and End of Year (spring) questionnaires were analyzed. Questions include demographics, educational and career objectives and self perception items. Of the 173 response sets examined, the Responders differed from Fall Responders (students who failed to answer in the spring) on two items at the .01 level of significance. Both items were from the Pre-Term Questionnaire semantic pair descriptions: The "impersonal/personal" dimension of question 30, "You as you see yourself" and the "soft/hard" dimension from question 31, "You as you would like to be." The same analysis performed on data from Responders and Spring Responders failed to detect significant differences.

Given these results it was reasonable to use the total spring and fall samples in further analysis, either omitting or giving special attention to the two variables which were significantly different at the .01 level.

Data Handling Capabilities: File Structure and Data Access Procedures

Structuring and analysis of d ta from the questionnaires were greatly simplified by the use of an integrated computer system capable of performing a varied set of tasks. The basic capabilities of this system included pre-processing and storing questionnaire data in magnetic disk files, accessing data, performing statistical analyses, generating tabulations and producing graphic displays.

The data files combined all measures obtained from students and faculties at the thirteen colleges and universities. Since members of these educational communities were interested in obtaining information from the system without having to learn "computer programming", the system was designed to process simple user requests allowing student and faculty members relatively easy access to selected information.

Since many faculty and administratives preferred graphic summaries of data, report generator packages were developed to provide easily assimilable displays of comparative course evaluation data used in program evaluation. Other routines were written for specific research purposes. For example, a unique plotting program was developed to simplify presentation and interpretation of discriminant analysis output.

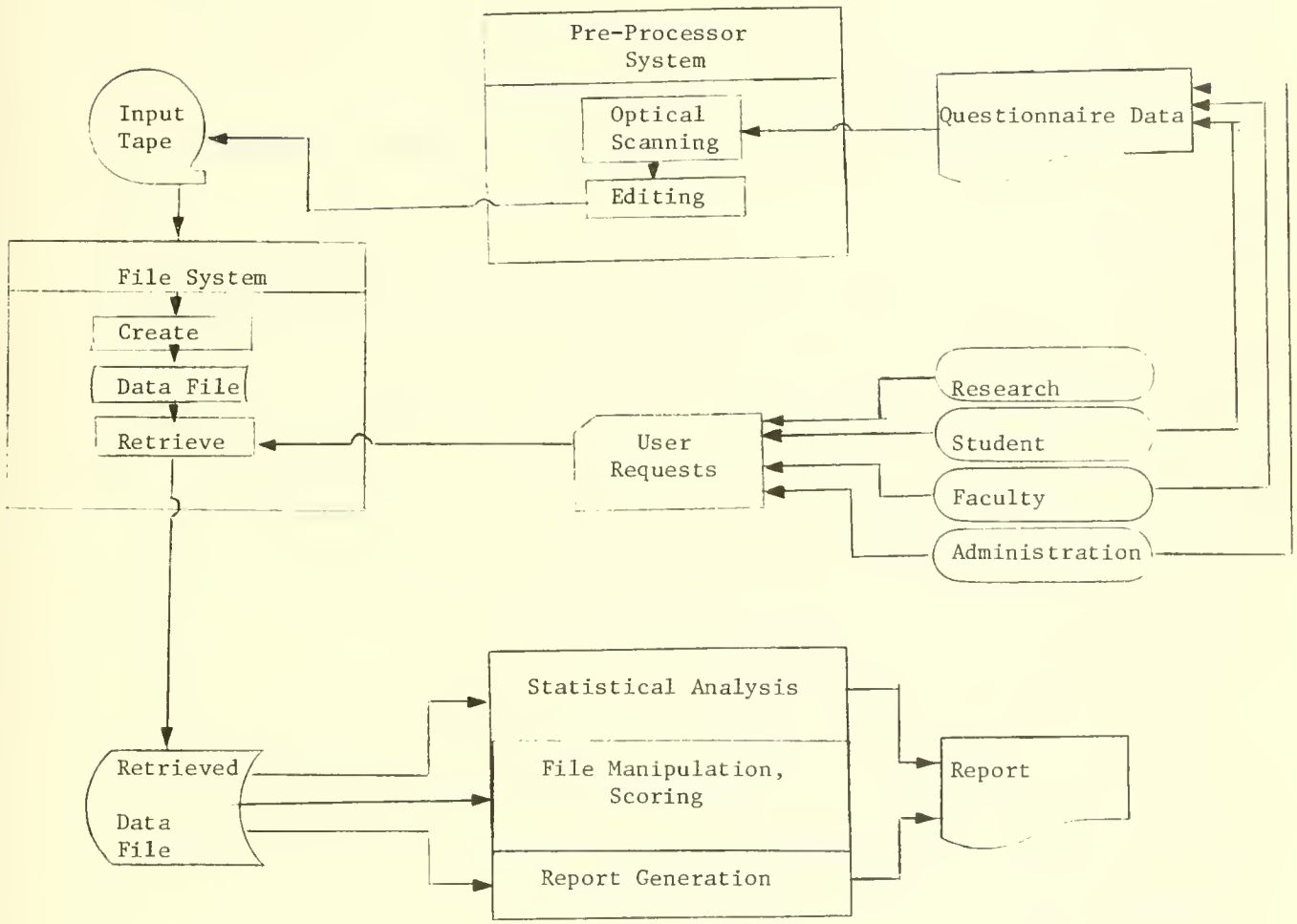
The following description is intended to provide an overview of the main file system and retrieval program.

Data Preparation

The basic system structure is illustrated in Figure 5.1 page 5-17. Student and faculty questionnaires are optically scanned and edited, producing accurate magnetic tape records of the raw data. The tape records are then "pre-processed." This step involves sorting and merging different pages of a single questionnaire; checking and editing data and preparing it as input to the main storage and

Figure 5.1

Information System Structure



retrieval program (FS1-File System 1).

File System 1, the main data storage and retrieval system, performs two major functions:

1. Creation (or conversion) of pre-processed data to final format for storage in a source file on magnetic disk.
2. Retrieval of specified information from one or more source files.

File Creation

The creation routine links data from all questionnaires filled out by students at each school. Data are grouped chronologically. The Pre-Program questionnaire, the first questionnaire filled out by students, becomes the base file to which all other data from a particular school are related. Linkages for the undergraduate study involving only two questionnaires are easily established - the Pre-Program questionnaire becomes the source file to which End of Year questionnaires are linked.

Graduate file creation is complicated by the number of different types of questionnaires to be related. Five major questionnaire types (student Pre- and Post-Term, Course Evaluation and Professor Pre- and Post-Course) are administered throughout the school year.

Student and faculty questionnaire files are treated separately. Student entering (Pre-Term) questionnaires become the base file, to which course evaluation data and year-end responses are linked.

Since faculty data are course specific, the professor Pre- and Post-course questionnaires are related via course numbers. Student course evaluations may also be linked to faculty course data through these course codes.

Course specific data for each student are linked through pointers originating with the 9 digit student identification number recorded in the Pre-Term questionnaire and matched with identification numbers from other questionnaire sets. Student data is filed by identification number and course number.

The process of tracing student responses by pointers was generally used for data aggregation. For example, a user who wished to examine student change in expectations from fall to spring would request that the system create a work file containing data for all students who responded at both times, deleting data from students who responded to only one questionnaire. The system was designed to insure that specific student identification numbers remained strictly confidential. Although student ID numbers were recorded in the source file and used to match responses from the same student on different questionnaires, identification codes could not be printed or stored in work files.

Data Retrieval

The data retrieval capability of FS-1 provides for extremely flexible data access. The user simply describes the school and questionnaire(s) he wishes to examine, and gives commands indicating:

1. the population (set or group of students) to be identified; and
2. the data to be displayed in the work file or report.

The user may define a population based on any measure maintained in the files. For instance, he might specify all first year Sloan School students with more than two years of work experience prior to graduate study. After defining the population, the user identifies the set of questionnaire responses he wishes to see for that population. For example, he might wish to examine five self perception items from the Pre Term Questionnaire.

Both commands may become quite elaborate, involving multiple constraints upon the population, and up to 120 items of retrieved data. The user may also take advantage of linkages between the various files of one school made in the earlier creation step. The system allows the user to search through multiple files (multiple questionnaires) while keeping each student's answers

intact. For example, a user might examine course evaluation responses from all students taking Course A,Section B who exhibited characteristics X, Y, and Z in their Pre-Program questionnaires. Responding to this request the system first locates students with appropriate entering X, Y, and Z characteristics . It then searches the course evaluation files for the ID numbers of the appropriate students. When matches occur the desired course evaluation data are retrieved.

The retrieved data file may be stored temporarily on disk, or transferred to punched cards or magnetic tape at the user's option. This "work file" then becomes the input to various statistical routines, or to report generator or graphic display programs.

Statistical Analysis and Reporting

Having traced the path of questionnaire response data through scanning, pre-processing, file creation and retrieval, we are now ready to examine statistical analysis and reporting. Detailed exposition of statistical procedures is not appropriate. However, it is important to identify the forms of analysis applied to the various types of data, and the reporting techniques used to structure and display responses.

Three multi-variate techniques were used extensively in the analyses presented in later chapters: factor analysis, cluster analysis and discriminant analysis. Each will be discussed briefly.

Nominal versus Interval Data

The appropriateness of certain analytical techniques applied in this research is determined in part by the measurement instruments used to obtain the data for analysis. In particular we must distinguish between nominal and interval measures.

1. Nominal data are generated through questions which require that the respondent choose from a set of discrete answers. For example,

"Please describe your religious affiliation"

1. Protestant
2. Catholic
3. Jewish
4. None
5. Other

It is assumed that only one answer is correct for each respondent and there is no simple relationship among alternative answers. The question is not scaled -- i.e., the response "1" has no rank order relationship to the answer "5". The answers are "different", but no relationship is assumed to exist among them. Discrete data are generally compared by means of simple binary chi-square[1] analyses, and/or displayed in bar graphs.

2. Interval data are generated by asking the respondent to use a scale that combines ranking with a constant unit of measure. For example,

> "Indicate on a seven point scale the amount of change in yourself that you expect to take place this year as a result of your present studies where, 1 = no change, 7 = great change."

As in the nominal case the respondent is expected to choose a single response from the seven alternative responses offered by the scale. However, all seven choices are assumed to be related and to be equidistant points along the same gradient. Using an interval scale, it is possible to compare changes of different individuals but it is not possible to assert that one response is "X times greater" than another.

Data Organization

The undergraduate and graduate Pre-term Questionnaires incorporated both nominal and interval scales. Questions involving interval scales will be grouped into seven logical subsets. All of these items are related to the

[1] Chi-square results are presented in the analysis chapters only if they are significant at the .05 level or better. For a highly readable layman's approach to basic survey analysis techniques and explanations of the meanings of significance levels see Ferber, Market Research (McGraw Hill; New York, 1949).

overall educational measurement objective. However, because of varied subject matter and formats, they will be analyzed as separate units. Since the End of Year Questionnaire is a past-tense version of the Pre-Term questionnaire interval scaled items on that form will be organized in terms of the same seven subsets. Questions involving nominal scales are used to obtain demographic information which should not change over time. These items appear only on the Pre-Term Questionnaires.

The Student Course Evaluation Questionnaire will be similarly subdivided into three basic question sets. Much of the analysis performed using responses from the Professor Pre-Course questionnaires will involve all items from that instrument. However, it can also be subdivided into compatible logical units. (The Professor Post-Course questionnaire is a past tense version of the Pre-Course instrument with the omission of questions relating to intended course content and scope).

Pre-Term Questionnaire Data Structure

(The questionnaire presented in the Appendix should be referenced for the detailed wording of items discussed below).

Nominal scaled responses are obtained in most Pre-Term questions included in "Part I-Personal Background" and the salary and job expectations questions in later sections. Data obtained from these items were analyzed using chi-square analysis.

The remainder of the Pre-Term Questionnaire is composed of interval scaled questions where the respondent is asked to indicate his evaluation on either a seven or four point scale. These items are separated into the previously noted seven subsets. Five of the seven involve student expectations regarding education and career. The other two sets are based on semantic differential perception data and personal opinions respectively. Table 5,4 summarizes this data structure.

Table 5.4

Seven Interval Data Subsets

Content	Subset	Questionnaire Section	# of items in subset
Education and Career Expectations	Question 21	Part II	9
	Question 22	Part II	19
	Question 23	Part II	19
	Question 24	Part II	21
	Question 29	Part II	17
Semantic Differential Perception Data	Questions 30, 31, 32	Part III	90
Personal Opinion Data	Schein Personal Opinion Questionnaire	Part IV	94

Student Course Evaluation Data Structure

Interval scaled responses from the Student Course Evaluation questionnaire will be divided into three subsets summarized in Table 5.5: 1) Learning Outcome Data, the "Ability to..." questions on page 1 of the course evaluation questionnaire; 2) Classroom Environment dimensions such as "Professor motivates students..." on page 1 and 2 of the questionnaire; and 3) Professor Personality Characteristics -- 31 semantic differential adjective pairs on page 2 of the questionnaire.

Nominal scaled responses to the questions on page 2 of the questionnaire were used primarily for faculty feedback.

Table 5.5

Student Course Evaluation Data Subsets

Subsets	Page	Number of items
1. Learning Outcome "Ability to..." questions	1	21
2. Classroom Environment Variables	1 & 2	29
3. Professor Personality Characteristics	2	31

Professor Pre-Course Data Structure

The data subsets used in segmented analyses of the faculty questionnaires are summarized in Table 5.6. In some analyses (see particularly Chapter 10), data from this questionnaire are used in toto without subdivision.

Table 5.6

Professor Pre Course Questionnaire Data Subsets

Subsets	Page	Number of items
1. Description of intended course content	1 & 2	45
2. Expected student learning outcomes	2	21
3. Learning mechanisms (lectures, discussions) to be employed	2	14

The Basic Report Generator

The basic Report Generator used in this study displays raw and/or factored data. The first objective of the report generation package was to give faculty and students rapid and meaningful "feedback" based on the large number of questionnaires, by providing an easily decipherable 'look at the data'. Figure 5.2 illustrates the use of the basic report generator to summarize course evaluation responses at the Sloan School , (see page 5-26).

The program displays the mean of responses ('X'), one standard deviation on each side of the mean ('V' , for variation),the skewness of the data distribution ('S' , plotted as S = $\bar{X}$ - the computed skewness) and the full range of responses (+-----+).

The generator accepts raw data input from cards or disk. The user has the option to convert raw data to factor scores, to control the order in which variables are displayed and to specify report titles, variable titles, scale ranges and graph headings.

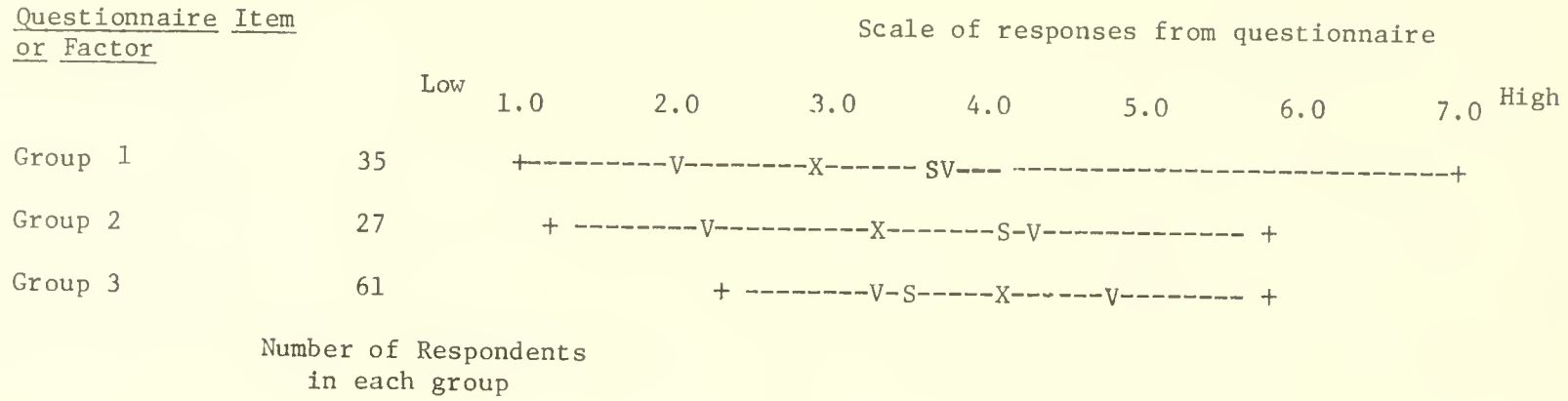
Data may also be sorted on various keys prior to reporting, i.e., the user may direct the generator to display the responses of five groups ranked in ascending order by their mean responses.

Two significance tests are included in the report generator package: a t test between group means, and an F test for differences in group variation.

Factor Analysis

When multiple questions have been asked which deal with the same underlying concept, simple variable by variable comparisons are not adequate. In such a situation factor analysis may be employed to ascertain the relationships among each of the separate questions or test items.

Figure 5.2 Report Generator Output



Explanation of Graph:

+---------+	indicates the overall range of responses
X	represents the mean
V-----V	indicates one standard deviation on either side of the mean
S	represents the skewness of the data plotted as the mean less the computed skewness.

In the above example the various groups are organized in order of ascending values of the mean. i.e., Group 1's mean = 2.9, Group 3 = 4.1)

Factor analysis is used to isolate the major underlying elements or concepts inherent in the data. We may think we are asking 19 totally independent questions and yet discover from factor analysis that we are in fact measuring only a small number of statistically distinct concepts. The question or items comprising each individual factor must be examined in order to establish the nature of the underlying concept.

The interval data sets identified in the previous section can be analyzed to establish factors which represent major process concepts. These factors can then be used to compute factor scores which become the input to the desired analyses in lieu of the raw data from the questionnaires. Since each factor is independent of every other factor, this technique avoids the problems of multicollinearity.

In recent years factor analysis has found wide application as a data reduction technique. The concepts and methodology have been well documented and will not be restated here.[1] We will, however, comment on certain procedures followed in our research which vary from common usage.

The two types of factor analysis used in this study are known as "R" and "Q" factor analysis. R factor analysis is the traditional form based on correlations between variables. This form was used primarily for data reduction - the process of identifying a number of salient factors inherent in a large number of questions or test items. The several variations of 'R' analysis used in this study are noted below.

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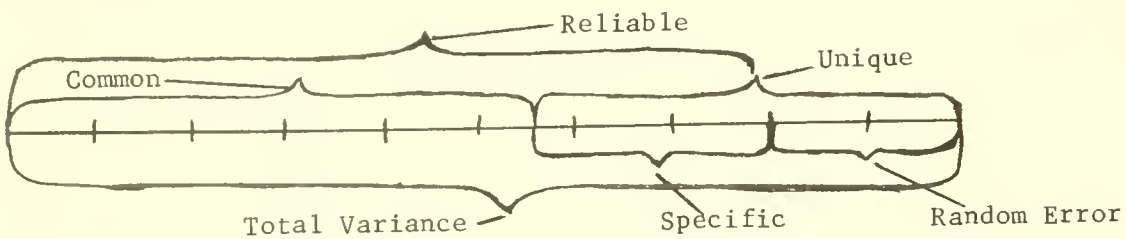
[1] For a technical and informative review of present directions in factor analysis, the most useful and current is Rummel, Applied Factor Analysis, Northwestern University Press, 1970. For the behavioralist interested in a brief summary of factor analysis methods and an easy to use factoring package we recommend Norman H. Nie, Dale H. Bent and C. Hadlar Hull, Statistical Package for the Social Sciences (SPSS), New York: McGraw Hill, 1970. (Note: the routines used in this research were designed by the authors using the IBM Scientific Subroutine Packages. SPSS was not "up and running" at M.I.T. during the analysis period of our research.)

Q factor analysis differs from R analysis in that Q analysis uses a correlation matrix of units (e.g., courses), calculating the association between units (individual courses) while R analysis focuses on variables. Q analysis runs involve principal component analysis with an eigenvalue cutoff of 1.

Although we experimented with alpha and scaled image techniques, only one application (of alpha analysis) is reported directly in this study. We will therefore limit this discussion to principal component analysis and common factor analysis.

The difference between principal component analysis and common factor analysis is in the portion of the variation taken into account by the techniques.

Rummel[1] has illustrated the components of total variance with the following diagram:



> The common variance of a variable is the amount of variance that can be explained by its relation to other variables in the matrix. The remaining variance is that which is unique to the variable, and consists of two parts:
>
> 1) Specific - that which can be explained by the variable itself;
>
> 2) Random - variance due to random error in observations.

---

[1] Ibid, Chapter 5.

Reliability is the part of the variance explained by the common and specific variances combined.

Principal component analysis computes the dimensions of the total variance, making no specific assumptions about the common portion and hence mixing all three types of variances.

Common factor analysis operates on the common variance (actually an estimate of the common variances) placing estimates of the communalities (in this case the squared multiple correlation coefficients) on the diagonal of the matrix of correlation coefficients. One weakness of this approach is that the procedure will yield imaginary factors -- negative eigenvalues.[1] The number of factors is arbitrarily determined by an eigenvalue cutoff of one.

Common factor analysis was used in two contexts in this research; for reducing data from the Schein Personal Opinion Questionnaire and for reduction of the 90 semantic-differential adjective pairs. The common analysis presented the fewest factors which explained the greatest percentage of variation compared to other analyses. In most instances, principal component analysis with an eigenvalue cutoff of one was employed.[2] Alpha factor analysis was used in the reduction of Question 21 only.

Factor Loadings

The composition of a factor -- the relationship between the factor and the input variables -- is described by the factor loading (which is the correlation between that factor and variable). A high variable loading (such

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[1] See C.W. Harris, "Some Rao-Guttman Relationships," Psychometrica, Vol. 27, 1962, pp. 247-263.

[2] It should be noted that this procedure is identical to that used in the first iteration of alpha factor analysis, and, in fact, the resulting principal components are usually only slightly different from those obtained by alpha analysis. See H. Kaiser and J. Caffrey, "Alpha Factor Analysis," Psychometrica, No. 30, 1965, pp. 1-14.

as .9875) indicates that the variable makes a large contribution to the factor (and has a high correlation with it), while a low loading (.0023) shows the reverse.

The only factor loadings reported in this chapter are those for the factor having the highest loading or correlation with each variable (or test item). If an item is ambiguous (i.e., has a high loading with more than one factor), that loading is marked with an asterisk. A single asterisk indicates that the variable loads on two factors at .4000 or higher and a double asterisk, .5000 or higher.

A relatively simple cutoff procedure was applied to variables with high loadings on multiple factors. The object of this exercise is to limit the number of factors on which a variables "loads" in order to produce non-overlapping factor sets. Examination of the variable communalities (the sum of the squared loadings for each variable), reveals that variables with very low communalities will not contribute significantly to any factor. The procedure involved in determining a cutoff point for loadings was based on this condition as follows:

-the average communality is computed,
-the average communality is divided in half (assuming that a variable could load on 2 factors) and
-the square root of the result becomes the loading cutoff.

Thus an average communality of .8000, produces a factor loading cutoff of approximately .6000 ($.6 \tilde{=} \sqrt{.8/2}$). Principal component analysis generally produced cutoffs around .5000, while the cutoff for common factor analysis was normally lower (.4000 or .3000).

Factor Scores

Factor scoring involves a rather complicated procedure which we can most easily describe as the weighting or scaling of raw variable responses using the variable factor loadings generated through factor analysis. Thus if variable X had a high loading (e.g., .8000) on a factor in the

original factor analysis, that variable will be highly weighted in later factor scoring procedures.

Both factor analysis and factor scoring procedures require complete data, i.e., no zero or blank responses. Because of the relationship between variables in each factor, the absence of response on an item may cause a completely erroneous score on a scale - especially if a key item (high loading variable) for a factor is neglected. (The actual factors and loadings used in later analyses are described under "Data Reduction Results" on page 5-51 and following.)

Cluster Analysis

Cluster analysis is a multi-variate technique used to establish sub-groupings or clusters of objects, (e.g., students, faculty, or courses), as opposed to the variables combined through R factor analysis. In some senses cluster analysis may be compared to Q factor analysis, because both operate on objects. However, cluster analysis employs different methods of computation and operation.

If the researcher suspects a priori that his data are drawn from a number of subgroups, although he does not know the number of subsets or their composition, he may turn to cluster analysis. The cluster analysis program used in this research[1] permits the analyst to explore the nature of his data by setting a minimum of constraints. If he directs the program to produce, say, three clusters from the data, the routine uses a hill climbing technique to achieve this objective. First, the data are arbitrarily assigned to the number of groups specified by the user. The program

[1]The package used is the "Cluster Analysis and Taxonomy System for Grouping and Classifying Data", written by Jerrold Rubin and Herman P. Friedman. It is part of the IBM Contributed Program Library (128 K Version 360, D 06.7.005), 1967.

then takes each response individually, and adds it to each of the three groups separately. Using a criterion value (the ratio of between group to within groups dispersion) the program compares the criterion value prior to the addition of the new response to that after the addition has been made. The member is assigned to the group having the greatest criterion value increase.

The researcher may direct the program to repeat the process using random starts - beginning at different points in the data - and may request different numbers of groups based on evidence from prior runs. If he has an a priori concept of group membership he may specify a beginning partition and ask the program to improve upon it. The final result of each run is a division of objects into groups, a listing of group membership, the best value of the criterion for the final partition, and scattergrams portraying the relative location of each group.

Multiple Discriminant Analysis

Since our use of multiple discriminant analysis goes beyond that normally encountered in this type of research we will attempt to explain the nature of discriminant analysis, the types of tests and results produced, and the procedures used to interpret these results. Since the mathematics of the technique will be presented using vector notation those who are not familiar with vector notation or those who are simply not interested in the specifics of the analysis may focus on the figures.[1]

We will begin this section with a qualitative description of discriminant analysis designed to provide a conceptual "feel" for its objectives and in-

[1] An excellent summary of discriminant analysis and other multivariate techniques is provided in: P.E. Green and D.S. Tull, Research for Marketing Decisions, Englewood Cliffs: Prentice-Hall, 1970.

tuitive meaning. After basic terminology has been defined, we will compare discriminant analysis to classical tests for equivalent dispersions and means. The mathematics used to compute discriminant functions will then be described along with associated tests and outputs. Finally, methods used to classify data using discriminant functions will be summarized.

The Nature of Discriminant Analysis

The objectives of discriminant analysis are succinctly summarized by Green and Tull:[1]

1. Testing whether significant differences exist among the average "score" profiles of two or more *a priori* defined groups, assuming groups covariation and dispersion are equal and the distributions are multinormal.

2. Determining which variables account most for such intergroup differences in average profile.

3. Finding linear combinations of the predictor variables that enable the analyst to represent the groups by maximizing among-group relative to within-group separation.

4. Establishing procedures for assigning new individuals whose profiles, but not group identity, are assumed to be from one of the *a priori* defined groups.

The first objective states a major assumption which must be met before statistical significance of between group differences can be assessed. The second objective indicates that we must be able to identify the variables responsible for intergroup differences. The third objective is perhaps the most familiar: the reduction of the variable space in such a manner as to maximize intergroup differences. This is illustrated in Figure 5.3, where the two-variable scatter diagram is reduced to a one dimensional function separating groups A and B. The fourth objective states that we must be able to classify other individuals (or objects) on the basis of scores on the new discriminant function. (Figure 5.3 is on page 5-34)

[1] *Ibid.*, Chapter 12, page 369.

Figure 5.3 Example of Discriminant Analysis

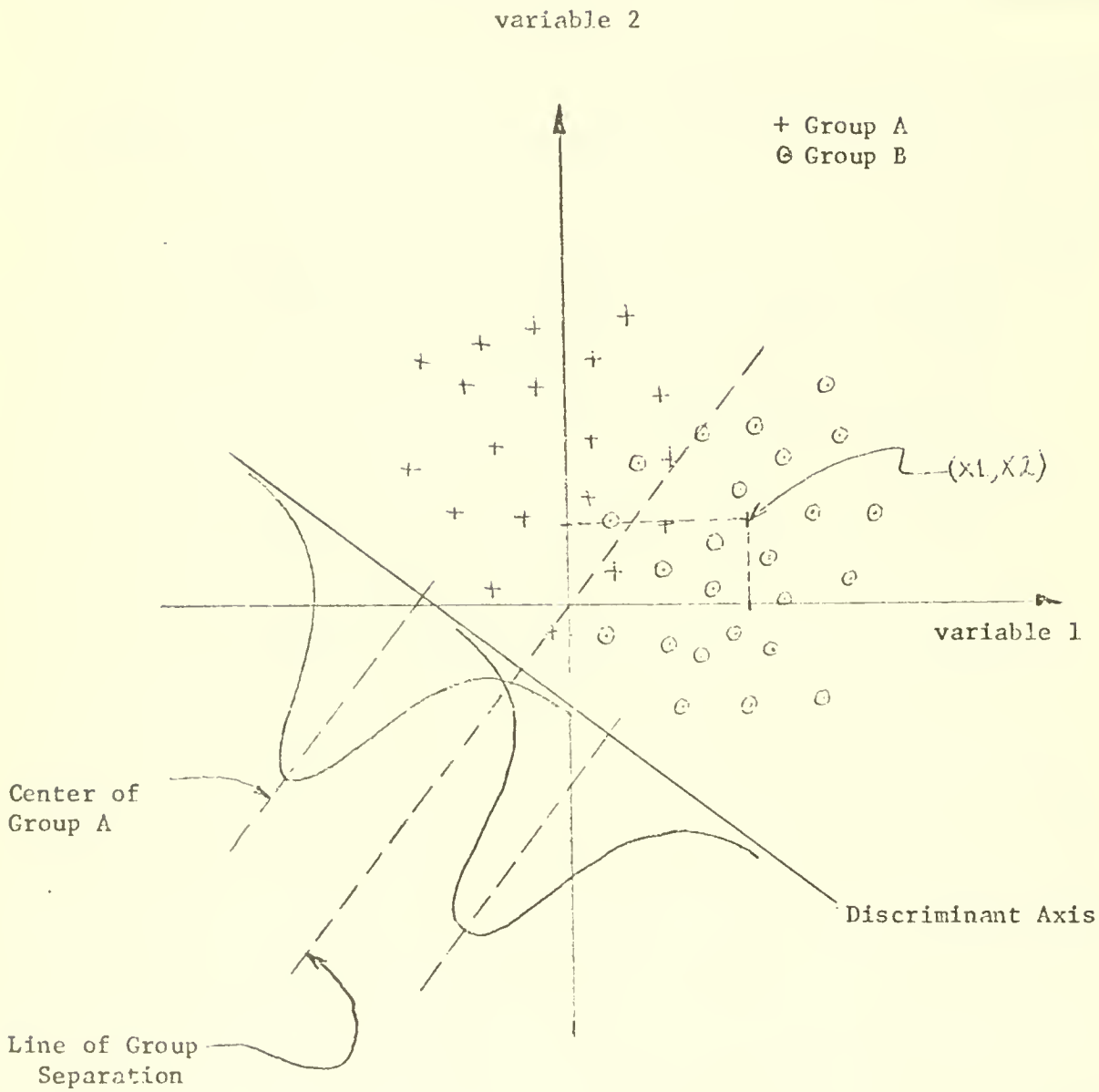

Figure 5.3 illustrates how a person scoring X1 on variable 1 and X2 on variable 2 would be classifed in group B. The two normal curves shown in the figure are the probability densities associated with each of the two groups. Thus for any point along the discriminant axis, there will be a certain probability of that point being in either group. An observation is assigned to the group for which it has the highest probability. We will have more to say about this classification process later in the chapter.

Mathematical Definitions

The mathematics of discriminant analysis is based on four matrices (used in the analysis) and the Wilks Lambda criterion (used to obtain the discriminant functions). These are defined as follows:

A. Dispersion Matrix, D where:

$$D_{ij} = \frac{-1}{(N_k - 1)} \sum_{n=1}^{N_k} (X_{in} - \bar{X}_i)(X_{jn} - \bar{X}_j) \quad \text{for } i = 1, p \quad j = 1, p$$

and: N_k is the number of observations in group k
p is the number of variables

B. Within groups Dispersion Matrix, W where:

$$W_{ij} = \sum_{k-1}^{g} (N_k - 1) D_{ijk} \qquad \text{for } k = 1, g \quad i \text{ and } j = 1, p$$

and: g is the number of groups

C. Between groups Dispersion Matrix, B where:

$$B_{ij} = \sum_{k=1}^{g} N_k (\bar{X}_{ik} - \bar{X}_i)(\bar{X}_{jk} - \bar{X}_j)$$

D. Total Dispersion, T such that

$$T = W + B$$

E. Wilks lamdba, Λ:

$$\Lambda = |W| \quad |T| = \prod_{i=1}^{q} \left(\frac{1}{1 + \lambda_i}\right)$$

Where: $q = \min (g - 1, p)$
λ_i = eigenvalue of the i th function

Classical Tests of Hypothesis

Two conditions must be met before a test for differences between group means can have meaning: (1) the distributions must be multi-normal, and (2) the group dispersion matrices (the covariance matrices) must be equal. In this research, we have assumed the first condition but used a procedure proposed by Lohnes to test the second assumption.[1] In this procedure (reported as the test of hypothesis one) the null hypothesis that the group dispersion matrices are equivalent is tested as follows:

$$M = n \ln |D| - \Sigma g(ng \ln |D_g|)$$

where: $n_g = N_g - 1$

$N = \Sigma^g(N_g)$

$n = N - g$

and $D = (1/n)W$

$$A_1 = (\Sigma g(1/n_g^2) - 1/n) \frac{2p^2 + 3p - 1}{(g - 1)(p + 1)}$$

$$A_2 = (\Sigma g(1/n^2 g) - 1/n^2) \frac{(p - 1)(p - 2)}{6(g - 1)}$$

---

[1] P. R. Lohnes, "Text Space and Discriminant Space Classification Models and Related Significance Tests," Educational and Psychological Measurement, Vol. 21, 1961, pp. 559-574.

$$f_1 = .5(g - 1)p(p + 1)$$

$$f_2 = (f_1 + 2)/(A_2 - A_1^2)$$

$$b = f_1/(1 - A_1 - f_1/f_2)$$

and the test is of $F^{f_1}_{f_2} = M/b$ unless

$A_2 - A_1^2 < 0$, in which case

$$f_2 = (f_1 + 2)/(A_1^2 - A_2)$$

$$b = f_2/(1 - A_1 + 2/f_2)$$

and the test is of $F^{f_1}_{f_2} = f_2\, M/f_i(b - M)$

If this null hypothesis is not rejected, the null hypothesis that the group means are equivalent can be tested. If we accept the reasoning normally used in classical single variable analysis, the second test should not be made if the dispersions (equivalent to variance for a single variable) are not equal.[1] The group means hypothesis is tested as follows:[2]

$$s = \text{SQRT}(p^2q^2 - 4)/(p^2 + q^2 - 5)$$

$$m = N - 1 - (p + q + 1)/2$$

$$1 = -(pq - 2)/4$$

$$r = pq/2$$

$$y = \Lambda^{1/s}$$

and the test of $F^{2r}_{ms + 21} = (1 - y/y)(ms + 21)/2r$

---

[1] Modern opinion is largely contrary to this view. See, for example, W. L. Hays, Statistics for Psychologists, New York: Holt, 1963, p. 3528.

[2] W. N. Cooley and P. R. Lohnes, Multivariate Procedures for the Behavioral Sciences, New York: Wiley and Sons, 1962.

The testing of these two null hypotheses is the limit of classical analysis: If both hypotheses ar accepted, one must assume that no differences exist, and if they are rejected, one can only state that there is a difference. Discriminant analysis permits us to move beyond these classical tests to discern intergroup differences by analyzing between group dispersions. This analysis yields one or more discriminant functions which can be used to reduce a set of original variable scores, by simple linear combination, to form one or more "scores" which may them be used to classify objects into one of the original groups.

Each discriminant function is one of a set of eigenvectors which together maximize the ratio of the between groups dispersion matrix (B) to the within groups dispersion matrix (W). This maximization is the equivalent of solving the determinental equation:

$$|W^{-1}B - \lambda I| = 0$$

where the λ are the eigen- or characteristic values of the matrix $W^{-1}B$.[1] The associated eigenvectors of this solution are the discriminant functions:

$$W^{-1}B = V \lambda IV^{-1}$$

where V is the matrix of eigenvectors.

The diagrams may help demonstrate this relationship.

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[1] W. N. Cooley and P. R. Lohnes, Multivariate Procedures for the Behavioral Sciences, New York: Wiley and Sons, 1962.

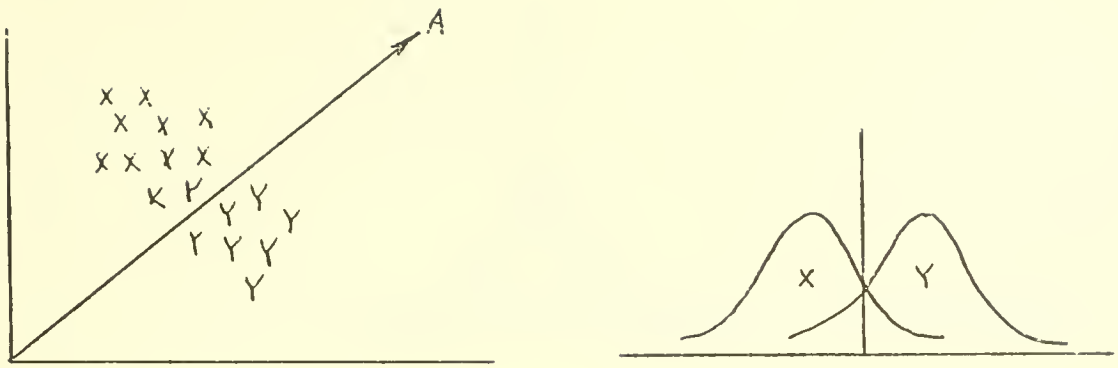

FIGURE 5.4 Maximum Separation by a Discriminant Function

Figure 5.4 is a simplified version of Figure 5.3 which illustrates the separation of groups X and Y by eigenvector A (left part). This separation maximizes the ratio of between groups dispersion to the within groups dispersion (right part) and becomes the primary function (function 1) which will explain the greatest percentage of the between groups differences. If the eigenvector were placed differently as in Figure 5.5 or Figure 5.6 it would obviously yield a lower ratio of between groups to within groups dispersion. Each new function (up to the number of variables or one less than the number of groups) must be orthogonal to all previous functions and must maximize the ratio of the remaining dispersions.

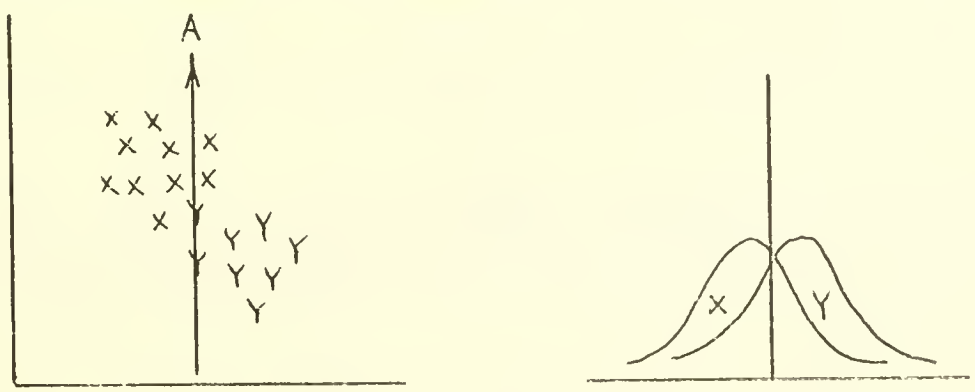

FIGURE 5.5 Moderate Separation by a Discriminant Function

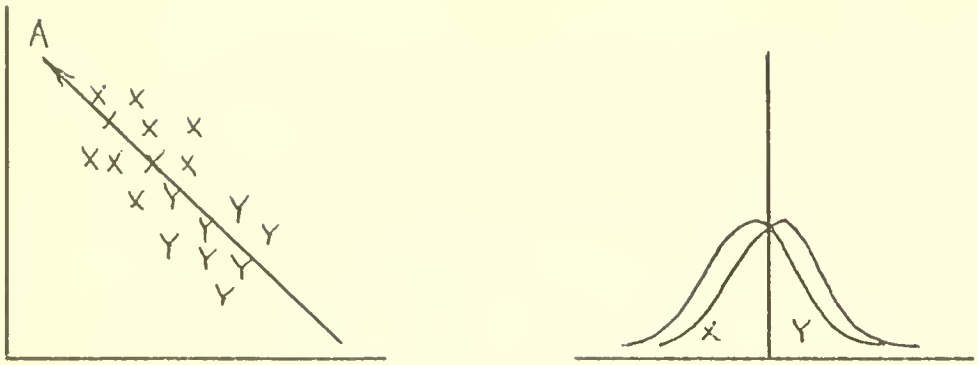

FIGURE 5.6 Minimum Separation by a Discriminant Function

Interpreting Results

Discriminant functions can be examined to determine which of the original variables contribute the greatest share of the resulting intergroup differences. However, two precautions must be observed before such an analysis is attempted: (1) the statistical significance of each function must first be established, and (2) the data must be examined to assess the possibility of either multicollinearity or heteroscedasticity. Heteroscedasticity (the problem of unequal dispersions) is not likely to be an issue if the data are multivariate normal and satisfy the equivalent dispersions test.[1] The problem of multicollinearity is more likely to occur, but can be controlled through procedures described by Farrar and Glauber.[2]

The statistical significance of each discriminant function can be tested using the method suggested by Rao.[3] Rao's procedure involves two tests based on a X^2 value computed for the eigenvalue associated with each function: (1) test the

[1] See J. Johnston, Econometric Methods, New York: McGraw-Hill, 1960.

[2] See D. E. Farrar and R.R. Glauber, "Multicollinearity in Regression Analysis: The Problem Revisited," The Review of Economics and Statistics, Vol. 47, No. 1, 1967, pp. 92-107.

[3] C.R. Rao, Advanced Statistical Methods in Biometric Research, New York: Wiley and Sons, 1952, pp. 370-378.

significance of that eigenvalues X^2, and (2) test the significance of the residual variance by summing the X^2 values for the other eigenvalues. This later test, of course, assumes that the eigenvalues have been arranged in descending order (which is done by the computation routine). The test for each eigenvalue is:

$$X_i^2 = (N - .5(p + g)\ln(1 + \lambda_i)$$

with: $NDOF_i = p + g - 2i$ degrees of freedom

The residual test for the residual after the ith eigenvalue is:

$$X^2_{RESID} = \sum_{j=1+1}^{q} X_i^2$$

$$\text{with } NDOF_{RESID} = \sum_{j=1+1}^{q} NDOF_i$$

Centours of Group Centroid Matrices and Centour Diagrams

Aside from the classification procedure discussed later in this chapter, the most meaningful method of assessing the discriminant power of a set of discriminant functions involves examination of the Matrix of Centours of Group Centroids.[1] This table contains values which indicate the relative statistical distances of each group centroid from every other group centroid. The centroid represents the mean value of all responses for each group, and statistical distance is measured in units of dispersion (or standard deviation). The centours (the concentric elipses surrounding the group centroid on a centour diagram) indicate the dispersion along each discriminant axis and the

[1] In order to standardize interpretation, each distance is converted into a centour (centile contour). A centour is an elipsoid which encloses a certain percentage of the population (while excluding a complementary percentage). Thus, the 0 centour excludes none of the population (and thus encloses it all) while the 90 centour exludes 90% - that is, 90% of the population lies beyond the 90 centour elipse.

correlation between the functions for that group. Figure 5.7 illustrates a centour diagram, and the relationship between a centour and a contour on a topographical map where height represents the probability density at a point, or the percentage of points falling within the centour. (N.B. the value assigned to a centour is the percentage of data points falling outside of the centour while probability densities refer to the percentage of data points within a centour).

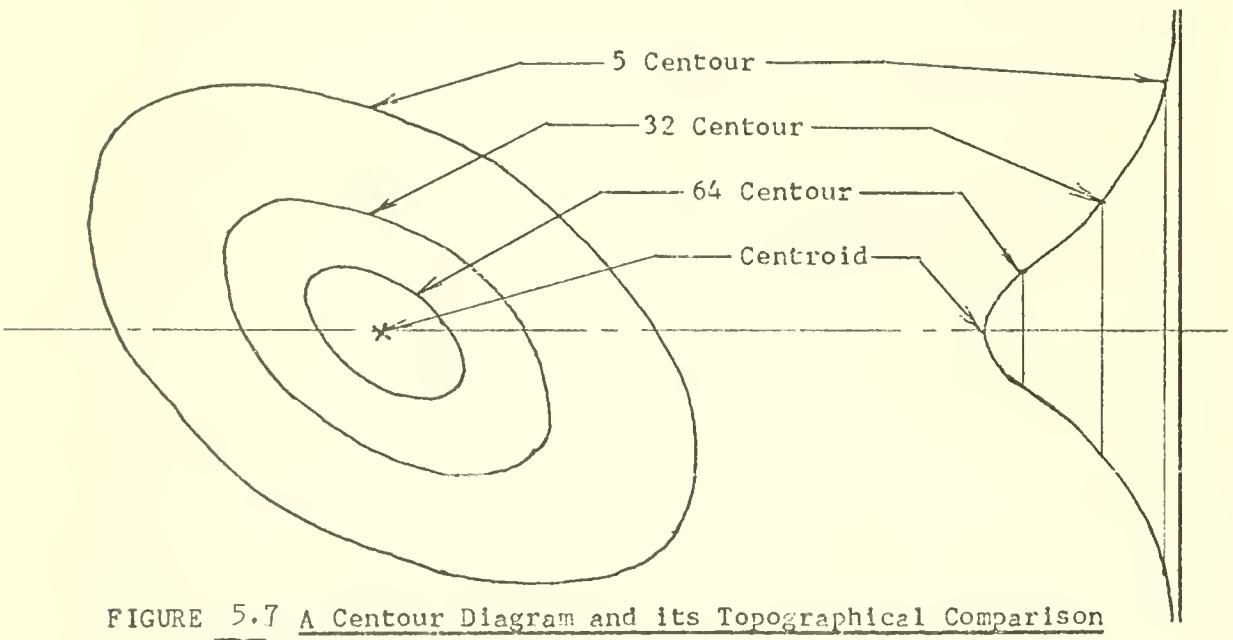

FIGURE 5.7 A Centour Diagram and its Topographical Comparison

A Centours of Group Centroids Matrix gives a measure of the distance between group centroids. In Figure 5.8 , the centroids of groups 1 and 2 are indicated by "+". The measure of the overlap of Group 2 on Group 1 that would be listed in the Matrix of Centours of Group Centroids is simply the Group 2 centour which passes through the Centroid of Group 1 (in this instance, the 32 centour).

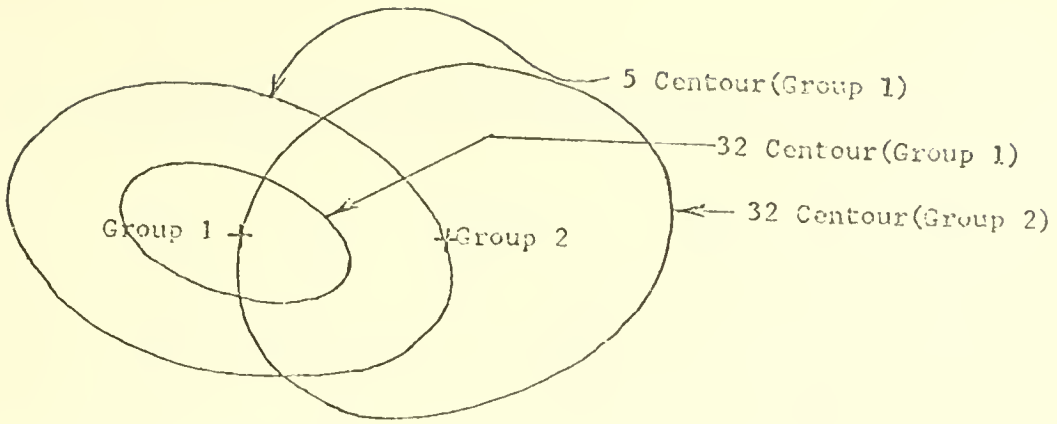

Figure 5.8 Illustration of Centours of Group Centroids

The distance of the Group 1 centroid from the Group 2 centroid is not the same as the distance of the Group 2 centroid from the Group 1 centroid. In this case, the Group 1 centour for Group 2 is 5. The units of measurement are determined by the dispersion of the group being measured. Because of the differences in dispersions in Groups 1 and 2, the recorded overlap between groups will not be equal. Group 1 will record less overlap with Group 2 (5) than Group 2 will record with Group 1 (32).

Figure 5.9 is a Centour diagram of the type used extensively in later chapters, (see page 5-44). Table 5.7, page 5-45 is the Centour of Group Centroids Matrix from the same discriminant analysis run. Examination of Figure 5.9 should lead quickly to several conclusions.

1. Function 1 (measured along the horizontal axis) separates Group 2 from the other groups.
2. Function 2 (measured along the vertical axis) separates Groups 5 and 6 from the other four groups.

Figure 5.9 Example Plot of Discriminant Functions 1 and 2

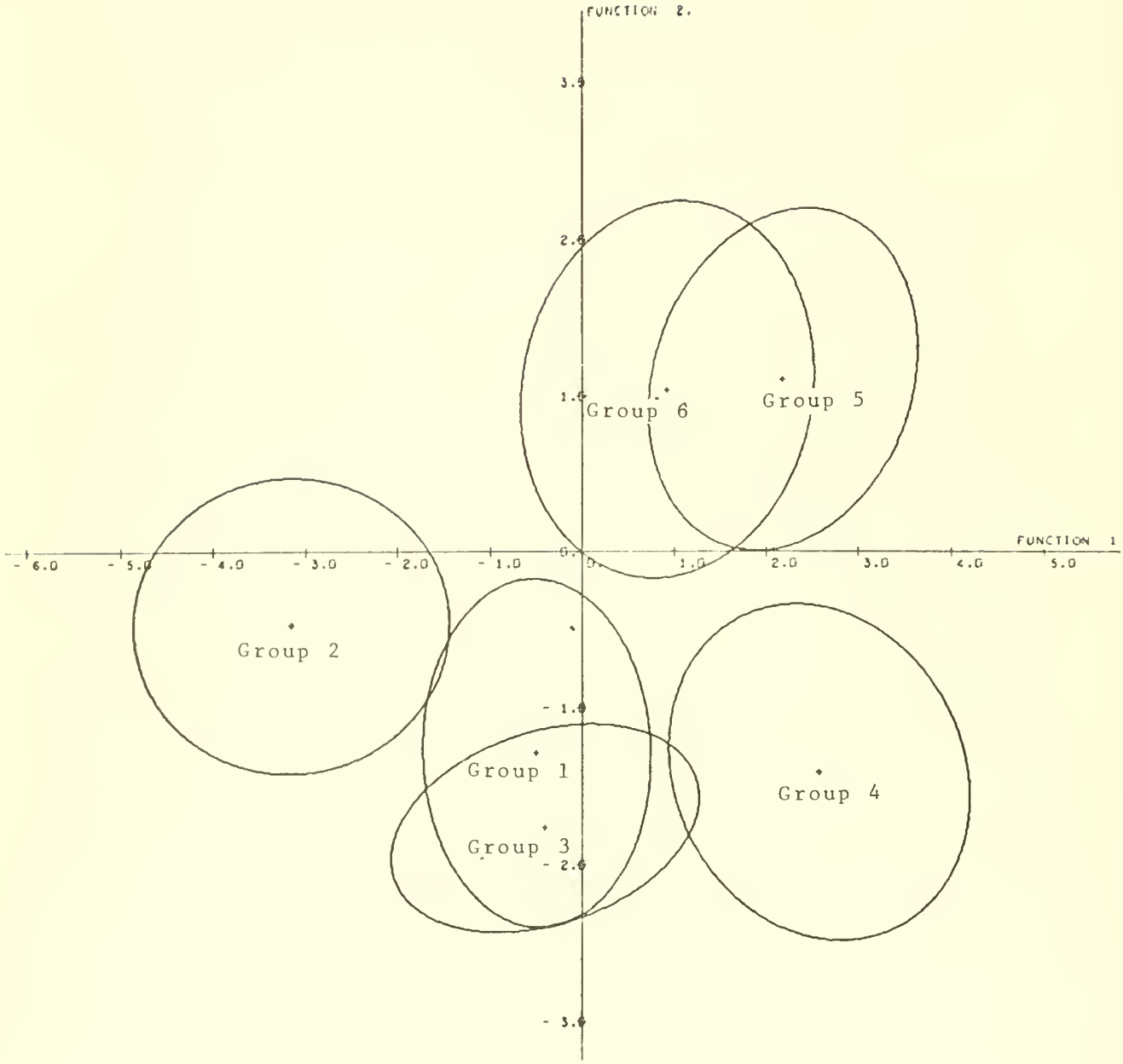

Table 5.7 Sample Centours of Group Centroids Matrix

Variable	Centroid Group 1	Centroid Group 2	Centroid Group 3	Centroid Group 4	Centroid Group 5	Centroid Group 6
Group Number 1	100.0000	7.8460	26.7578	5.5150	0.6068	2.0255
Group Number 2	0.7319	100.0000	0.0414	0.0902	0.0792	0.7349
Group Number 3	4.8972	6.7261	100.0000	9.2437	0.4171	5.2406
Group Number 4	0.4262	0.0738	3.3556	100.0000	5.1033	5.0390
Group Number 5	0.0839	0.0843	0.0055	5.9772	100.0000	36.5020
Group Number 6	0.7873	1.3653	0.0040	3.9115	32.3576	100.0000

3. Groups 2 and 4 exhibit the least overlap with other groups in the plot.

4. Groups 5 and 6 overlap significantly as do Groups 1 and 3.

The number of significant functions obtained in each analysis determines the number of centour diagrams produced by the program. Three significant functions yield three plots: functions 1 and 2; 1 and 3 and 2 and 3. The centour diagram is not as generalized as the Centour of Group Centroids Matrix because it displays the separation among the data along the axes defined by only two functions at a time. The Centour of Group Centroids Matrix on the other hand summarizes the statistical distance separating the centers of each data group.

The first column in the Centour of Group Centroids Matrix in Table 5.7 (Centroid Group 1) contains the statistical distance between the centroid of Group 1 and the centroids of each of the other groups. The only large overlap noted in this column occurs between Group 1 and Group 3: the 4.9 centour of Group 1 passes through the Centroid of Group 3. The corresponding entry in Column 3 (Centroid Group 3) shows a greater overlap. The 28.6 centour of Group 3 passes through the centroid of Group 1. As illustrated in Figure 5.7, the higher centour values are closer to the centroid while the lower values are associated with the outside circles.

The overlap figures from the Centour of Group Centroids Matrix provide an efficient summary of the relationship between groups. Thus in the current example we can state that the overlap between Groups 1 and 3 is 4.9 and 26.8. (Remember that these values will be equal only if the dispersions of the two groups are equal.)

The other major overlap detected by looking at the Centour Diagram in Figure 5.9 was between Groups 5 and 6. The Centour of Group Centroid figures describing the overlap between these groups of relatively equal dispersions are 32.4 and 36.5.

When interpreting discriminant analysis results we will generally follow a four step procedure.

1. The probability level of the chi square associated with each discriminant function will be examined to determine if at least one discriminant function is statistically significant. The chi square value indicates the chance that the discriminant function was based on random data fluctuations. Thus a X^2 of .05 allows for a 1 in 20 chance that the function would reoccur randomly.
2. If one or more functions are significant we turn to the Centour of Group Centroids Matrix to evaluate the degree of overlap among the groups being analyzed. This evaluation must be subjective as there are no absolute criteria for significant overlap. In general, if all Matrix values are high, say greater than 50, we are not likely to achieve useful between group discrimination. However, even if this is the case it is often helpful to make an additional check of the classification results achieved using the procedure described later in this chapter. If individual group identity is maintained in the classification, we will go on to step 3. Despite the somewhat indefinite criteria associated with its use, the Centours of Group Centroids Matrix provides the best overall statistical assessment of intergroup distances, based

on actual group dispersions. The separation indicated in this Matrix is a much more meaningful test for the original sample than the classification analysis.

3. The next step is to examine the Centour diagram(s) to determine which discriminant functions are responsible for the separation of particular groups. The separation will parallel low overlap percentages noted in the Centour of Group Centroids Matrix.
4. Finally we will refer to the normalized discriminant functions and and variable contribution tables to identify the variables responsible for the discriminant power of each discriminant function. The normalized discriminant functions provide a statistical measure of the discrimination attributable to each variable, while the variable contributions table can be used to determine the between group differences attributable to each variable. Those variables with the largest coefficients in the normalized discriminant function are responsible for the power of the discriminant function. Variables exhibiting the greatest between group differences can be identified in the variable contribution table. The values shown in the variable contribution table are computed by multiplying the group mean for each variable by the associated discriminant coefficient.

The four steps are repeated for each significant function. The process is summarized graphically in the flow chart on page 5-49, Figure 5.10.

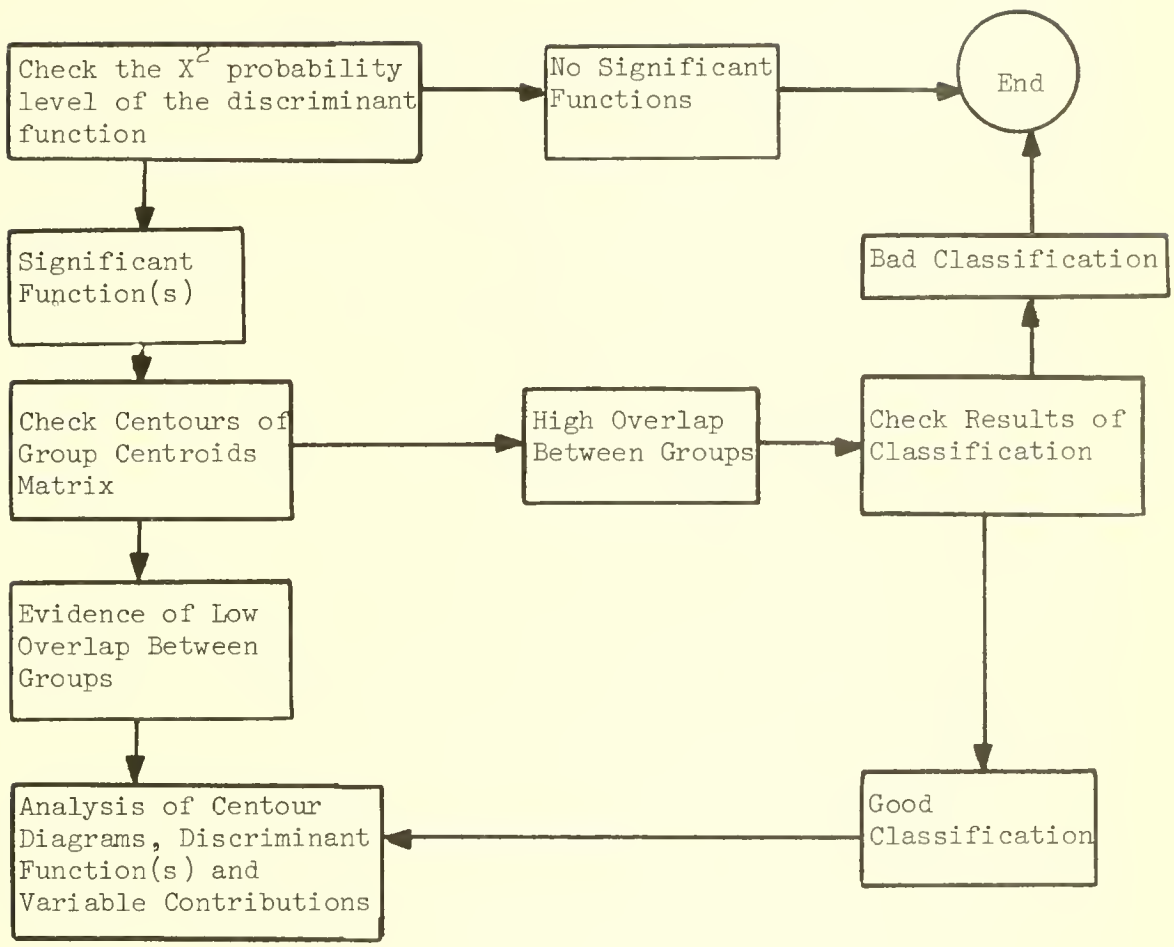
Check the X^2 probability level of the discriminant function
No Significant Functions
End
Significant Function(s)
Bad Classification
Check Centours of Group Centroids Matrix
High Overlap Between Groups
Check Results of Classification
Evidence of Low Overlap Between Groups
Analysis of Centour Diagrams, Discriminant Function(s) and Variable Contributions
Good Classification

Figure 5.10 Discriminant Analysis Interpretation Procedure

Classification

The classification procedure used in later analyses is based on the relative statistical distance of an object from the centroid of each group. An object is classified as belonging to the group to whose centroid it is the closest. A chi square value is computed from the discriminant space dispersion matrix ($DD + V^TDV$) for each original group and the object is assigned to the group with the lowest X^2.[1] That is:

$$X_i^2 = y_i^T DD_i y_i$$

where:

$$DD_i = V^T D_i V$$

$$y_i = V^T Y - C_i$$

$$C_i = V^T Y_i$$

Y is the original observation of p variables, and Y_i is the mean vector for the ith group.

The probability of group membership can be computed using Bayes theorem (incorporating the a priori knowledge of the likelihood of membership based on the relative size of the groups). The probability that an object is in the ith group is then:

$$P_x = \frac{(p_i/\text{SQRT}\ |D_i|)\ \ \text{EXP}\ (-X_i^2/2)}{\Sigma k(p_k/\text{SQRT}|D_k|)\ \text{EXP}(-X_k^2/2)}$$

where p_i is the ratio of the size of group i to the total of all groups.

---

[1] This procedure is developed in W. W. Cooley and P. R. Lohnes, Multivariate Procedures for the Behavioral Sciences, New York: Wiley and Sons, 1962, pp. 135-138.

Data Reduction Results

We turn now to the results of data reduction achieved by applying factor analysis to data from each type of questionnaire. Our interpretations of the factorial concepts emerging from these analyses and the actual variable constitutions (including factor loadings) comprising the factors will also be discussed.

This section is organized by questionnaire. The first results to be considered involve the seven data subsets associated with the Pre-Term questionnaire. (Pre-Term factors were also used to factor score Post-Term data). Two later sets of analyses focus on Course Evaluation and Professor Pre-Course questionnaire data. Factors for item sets included in more than one questionnaire, such as the twenty-one learning outcomes which appear in all questionnaires, are discussed in the context where they are most frequently used.

Pre-Term Questionnaire Factors

The Pre-Term Questionnaire is subdivided into four logical data subsets discussed earlier in this chapter: (1) Personal background information (demographic data) consisting largely of discrete category questions; (2) Educational and career expectations (five question sets analyzed individually); (3) Semantic differential adjective pair descriptions of self, ideal self, and typical manager (three question sets analyzed as a unit) and (4) The Schein Personal Opinion Questionnaire (analyzed as a unit). Subsets 2, 3 and 4 were factor analyzed and the data factor scored prior to input to most other statistical routines and/or reporting programs. The factor analyses

were performed on Fall 1969 graduate data. Undergraduate responses were factor scored using factors from these graduate analyses. Post-Term graduate and undergraduate data were also factor scored using Pre-Term factors.

Educational and Career Expectation Factors

Part II of the graduate and undergraduate Pre-Term Questionnaire booklets focuses mainly on educational and career expectations. The specific questions involved are numbers 14, 15, 16, 21, and 29 on the undergraduate version and the corresponding graduate question numbers 21, 22, 23, 24, and 29. The graduate numbering system is used in the following discussion. Questions are considered in numerical sequence except for the learning outcome expectations (question 24) which are analyzed in the Course Evaluation section.

With the exception of Question 21, principal component analysis with an eigenvalue cutoff of 1.0 was used to reduce these expectation data.

Reasons for Pursuing Graduate Study

Question 21 of the Pre-Term Questionnaire booklet is concerned with nine potential motivations for pursuing graduate study. The question:

> 21. Below is a list of possible reasons for pursuing graduate study. On a 7-point scale please indicate the extent to which the statement is accurate in describing your thoughts and motivations to enter graduate school, where 1 = not applicable, 7 = very applicable

Nine items which followed are detailed in the Appendix.

For this particular questionnaire set, alpha factor analysis produced the greatest number of factors (3) and explained the

highest percentage of total variation in the data (28.5%).[1] The numbers in parentheses indicate the percentage of variation explained by each factor. Titles assigned to factors are our interpretation of factor content.

Factor 1 (13.96%)		Management Career Interests
	.6694	I have a desire to learn about underlying disciplines in my particular field.
	.5448	Graduate study will be an important part of my career.
	.4635	I desire to learn the attitudes and values necessary to pursue my career.
	.4509	I desire to gain the skills necessary to become more expert in a specific field of interest.
Factor 2 (8.17%)		Non-Academic Reasons for Entering Graduate Study
	.5256	My family would be pleased if I were to enter graduate study.
	.4555	I don't really want more education, but I feel that I have to have it.
Factor 3 (6.45%)		Preparation for an Academic Career
	.6961	I am preparing for an academic career.

Factor 1 combines a logical set of reasons for pursuing any profession-oriented graduate program. The stress on career and application aspects of the program contrast to Factor 3, which is concerned with the purely academic application of graduate education.

Factor 2 expresses perceived family and societal pressure to 'Get that Degree! '

[1] Despite their distinctiveness, the factors failed to discriminate between student groups on the undergraduate or graduate level. Student responses to these questions were consistent and homogeneous. The items were therefore useless as discriminators or as change indicators, and were not included in later analyses.

Strengths and Weaknesses of School Attended

Question 22 is concerned with nineteen characteristics of a university. (A complete listing of all characteristics is provided in the Appendix.)

> 22. Below is a list of possible strengths and weaknesses of educational institutions. On a 7-point scale indicate your perception of whether the characteristic was a positive or negative factor in your rating of your particular graduate school. Mark a 4 if the characteristic was not relevant in your ranking.
>
> 1 = very negative
> 4 = not relevant
> 7 = very positive

Five factors explain 53.19% of the total variation in these data. The numbers in parentheses indicate the percentage of variation explained by each factor. Variables contributing to each factor are listed in order of the weight of their loadings, with the most prominent or influential variables first. Titles assigned to each factor summarize our interpretation of their content or meaning.

Factor 1 (12.14%) Student and Faculty Characteristics

.7521	Type of student attending
.6125	Faculty
.5952	Breadth of program
.5980**	Campus environment and facilities

Factor 2 (9.66%) Size of school and social climate

.7717	Size of school
.6110*	Social opportunities
.5358**	Campus environment and facilities
.4579*	Prestige of school

*Variable loads on 2 factors at .4 or higher

**Variable loads on 2 factors at .5 or higher

Factor 3 (12.41%) Academic Specialization

.7628	Research opportunities
.6339	Strength in your specific field of interest
.5963	Quantitative emphasis
.5054	Opportunity for specialization
.4759*	Practical experience available

Factor 4 (10.96%) Program Attributes

.8098	Case Studies
.6706	Integrated program
.5861	Required Courses

Factor 5 (8.02%) Location

-.6463	Location
-.5119	Community involvement
-.4853*	Practical experience available
-.4781	Cost and financial aid offered

The factors emerging from the responses to Question 22 offer a useful structure for the administrator interested in attracting students to his institution. The original item set does not allow for all possible determining factors. For example it excludes the student's parents being alumni of the school, or his current one-and-only love locating on a nearby campus. However, it includes a number of characteristics applicable to individual institutions which may be emphasized or played down by admissions and recruiting personnel to create a more desirable image for the school.

The factors emerging from these responses define specific areas of interest recognized by students selecting graduate business schools. Factors 1, 3 and 4 deal with the academic spheres, while 2 and 5 are concerned mainly with social and environmental aspects.

Factor 1 is particularly interesting because of its combined emphasis on student and faculty types present at the institution. Evidently incoming students have an overall perception of the university community - - a combined student body/faculty image. These two groups are consistently linked in the factor analysis results.[1]

The most prominent factor - - explaining the greatest percentage of the variation - - Factor 3, has the clearest content. Research, specialization, quantitative emphasis and experience form a tightly knit concept for all students, whether they view it as a positive or negative attribute of a particular institution.

Factor 4 includes program attributes and organization -- a concept closely tied to the information generally communicated by the school's catalogue.

The two socially oriented factors (2 and 5) are less salient, i.e., they explain smaller portions of the total variation than the other factors. The items in Factor 2 are recognized selling points of many admissions counselors. How many of us have gone on campus tours which emphasize the beauty of the campus and the surrounding area, the social opportunities or extra-curricular activities and especially the fabulous new facilities donated by appreciative alums.

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[1] Although principle component analysis was the main tool applied in this analysis, four types of factor analyses were performed for validation purposes to insure that factors represented were truly generalizable and not statistical "quirks". In two instances reported later, common factor analysis produced the most consistent and representative results.

The prestige of the institution can be easily inferred. The fifth factor involves a different and perhaps more pragmatic bent. The combination of practical experience, location, cost and community suggests a realistic orientation most easily attributed to the student working his way through a local or nearby institution.

Activities Contributing to Career Objectives

Question 23 asked the student to assess the relevance of various endeavors to his goals.

> 23. Please indicate on a 7-point scale your expectations as to how much each of the following activities will contribute to your career objectives where
>
> 1 = little contribution;
> 7 = great contribution

Nineteen activities detailed in the Appendix followed this question.

Four factors explain 58.41% of the total variation in the data. The numbers in parenthesis represent the percentage of variation explained by each factor. The names assigned reflect our assessment of each factor's content.

Factor 1 (14.47%) Outside Activities

.8788	Extra-curricular activities
.7693	Social activities
.6842	Community projects
.5446	Summer or school year job in industry

Factor 2 (11.63%) Classroom Activities

-.7649	Course lectures
-.7516	Course reading preparation
-.5915*	Class discussions

Factor 3 (10.41%) Independent Study

-.8086	Independent research
-.7990	Independent reading

Factor 4 (18.30%) Opportunities for Interaction

-.7130	Interaction with people from industry
-.7002	Interaction with faculty
-.6347	Research done with faculty member
-.5520*	Projects in industry
-.5484	Group projects
-.5410	Peer group interaction
-.5378	Seminars

The first three factors are self explanatory and do not require additional interpretation. We have labelled Factor 4 "Opportunities for Interaction" because the presence and cooperation of others is consistently implied, although the activities vary greatly.

Factors derived from responses to Question 24 concerned with learning outcomes are described in the Course Evaluation portion of this section.

Job Preferences

Question 29 focussed on desired job attributes.

> 29. People differ in what is important to them in a job. In this section we have listed a number of factors which people might want in their work. Please rate on a 7-point scale how important each of these factors is to you.
>
> 1 = of no importance
> 7 = of utmost importance

Seventeen characteristics detailed in the Appendix followed the question.

Five factors derived from responses to this question

explain 60.82% of the total variation in the data. The number in parenthesis indicates the percentage of variation explained by each factor. Names given each factor reflect our subjective assessment of its content.

Factor 1 (14.35%) Flexibility, Challenge and Freedom

.7274	Have considerable freedom to adopt your own approach to the job.
.7187	Have a job which allows you to make a real contribution to the success of the company or institution.
.6884	Have challenging work to do - work for which you can get a personal sense of accomplishment.
.5383	Have a job in which you have the opportunity to be helpful to others.
.5163*	Have a job in which you can have much authority.

Factor 2 (12.56%) Time for Personal Life

-.8073	Have a job which leaves you sufficient time for personal or family life.
-.6983	Have a reasonable work load, one which is not excessive.
-.5662	Have a job security.
-.5352*	Work in a department where the people are congenial and friendly to one another.

Factor 3 (9.71%) Earnings and Advancement Opportunities

-.8393	Have an opportunity for high earnings.
-.6572	Have an opportunity for advancement to higher level jobs.

Factor 4 (11.68%) Prestige

.8114	Have a job which is highly regarded by others.
.8061	Work for an organization with high prestige.

Factor 5 (12.52%) Departmental Efficiency-Working Conditions and Training Opportunities

.7099	Work in a department which is run efficiently.
.7269	Have training opportunities (to improve skills or learn new skills).
.5869	Have good physical working conditions (ventilation, lighting, etc.)

Factor 1, "Flexibility, Challenge and Freedom" contains many attributes of the perfect job for an idealistic, young and highly motivated student. It embraces many emotionally

desirable and generally "professional" dimensions that a student "should" want in a job even if his actual aspirations are much lower. The only potentially controversial element in the factor is "Have a job in which you can have much authority.", and this variable has the lowest loading in the set.

Factor 2 which we have designated "Time for Personal Life", consists mainly of variables designed to measure the relative importance of family and personal interactions. "Have a reasonable workload" and "Job security" fit in neatly with the dominant variable, "Have a job which leaves you sufficient time for personal or family life." "Work in a department where people are congenial and friendly to one another" completes the factor by adding a relatively easy-going, non-pressure dimension to the overall factor concept.

Factors 3 and 4 deal with advancement and prestige. It is particularly interesting to note that these two concepts emerge as separate and distinct factors. More often than not in our society, the two might be expected to be inextricably intertwined.

Factor 5 is composed of items regarding in-house working conditions and support.

Student Perceptions

Questions 30, 31, and 32 focussed on the student's image of himself, his concept of an ideal self, and his

perceptions of a typical businessman.

30. On the answer sheet are listed several sets of adjective scales which are frequently used to describe individuals. For each adjective pair, describe YOU AS YOU SEE YOURSELF (Real Self) by indicating the location on a 7-point scale where you picture yourself to be. If a pair of adjectives does not apply fill in a 4.

    Example: If you see yourself as being relatively relaxed, you might mark a 2 on the first item.

31. For each adjective pair (as in question 30) describe YOU AS YOU WOULD LIKE TO BE (Ideal Self)* on a 7-point scale.

32. For each adjective pair (as in question 30) describe your perception of a TYPICAL BUSINESSMAN.

The same set of 30 adjective pairs was used to measure each of the three concepts: the real self (question 30), the ideal self (question 31) and a typical manager (question 32). Our objective in factoring the three sets as a unit was to ascertain the degree of overlap between concepts. We were particularly interested in determining whether any of these concepts were completely independent -- e.g., would any factors composed solely of adjectives describing the real self emerge? Do ideal and real self perceptions overlap? We were also interested in establishing the basis for concept linkages. Upon which variables? How do perceptions of the typical manager relate to the real and ideal concepts?

Eleven factors explain 43.41% of the total variation in these data. The number in parenthesis represents the percentage of variation explained by each factor.

It may be useful to comment on the sign preceding each variable loading in the following factors. Remeber that the scales were presented in the format:

Awkward 1 2 3 4 5 6 7 Poised

A high loading on the Awkward/Poised set (whether positive or negative) emphasizes the importance of the variable. A negative sign indicates only that a higher number on the 1-7 scale for that variable is associated with lower numbers on the 1-7 scale for variables with a positive sign in the same factor. E.g., In Factor 1, individual responses would show that poised, sincere, enthusiastic, leads, mature, cooperative, etc. were related.

In common factor analysis the asterisk will be used to designate variables loading on more than one factor at .2000 or better.

Factor 1 (11.30%) Persuasive/Mature Leadership - Ideal Self

-.8202	Awkward/Poised	Ideal Self
-.8073	Insincere/Sincere	"
-.7960	Unenthusiastic/Enthusiastic	"
-.7760	Follows/Leads	"
.7722	Mature/Immature	"
.7659	Cooperative/Uncooperative	"
.7655	Efficient/Inefficient	"
-.7609	Lacks Confidence/Confident	"
-.7338	Unoriginal/Original	"
.7176	Tactful/Tactless	"
-.7107	Easily Influenced/Mind of own	"
.7019	Friendly/Unfriendly	"
-.6346	Inflexible/Flexible	"
.6301	Tolerant/Prejudiced	"
-.5907	Guarded/Frank	"
-.5619	Subjective/Objective	"

Factor 2 (8.12%) Cold/Confident Leadership - Typical Manager

-.7793*	Follows/Leads	Typical Manager
-.7589*	Easily Influenced/Mind of Own	"
-.6443*	Awkward/Poised	"

-.6382*	Lacks Confidence/Confident	Typical Manager
-.6337*	Unenthusiastic/Enthusiastic	"
.5875*	Efficient/Inefficient	"
-.5809	Cautious/Daring	"
-.6520*	Feels Inferior/Feels Superior	"
-.5444	Subjective/Objective	"
.5421*	Mature/Immature	"
-.5022	Inhibited/Uninhibited	"

Factor 3 (6.15%) Personal Attributes of the Real Self

-.6763	Mature/Immature	Real Self
-.6671	Cooperative/Uncooperative	"
.6565	Insincere/Sincere	"
.5985*	Friendly/Unfriendly	"
.5845*	Awkward/Poised	"
-.5816	Efficient/Inefficient	"
.5557*	Unenthusiastic/Enthusiastic	"
-.5332	Tactful/Tactless	"
.5327	Inflexible/Flexible	"
.5073*	Follows/Leads	"

Factor 4 (2.13%) Cynicism in Real and Ideal Self

.5137*	Not Cynical/Cynical	Real Self
.4230*	Relaxed/Anxious	Real Self
.4436	Not Cynical/Cynical	Ideal Self
.4361	Soft/Hard	Ideal Self
.4171*	Patient/Impatient	Ideal Self

Factor 5 (3.61%) Sensitivity and Sincerity of a Typical Manager

-.6419	Insensitive/Sensitive	Typical Manager
-.5765*	Insincere/Sincere	"
.5558*	Patient/Impatient	"
-.5430	Impersonal/Personal	"
.5030	Not Cynical/Cynical	"

Factor 6 (2.51%) Emotional and Personal Aspects of the Real Self

-.5834	Emotional/Unemotional	Real Self
.5505*	Impersonal/Personal	"

Factor 7 (2.41%) Daring/Uninhibited Real Self

.5529	Inhibited/Uninhibited	Real Self
.5108*	Cautious/Daring	"

Factor 8 (1.72%) Satisfaction-Ideal Self and Typical Manager

-.4047	Satisfied/Dissatisfied	Typical Manager
-.3793	Tactful/Tactless	Typical Manager
-.3768	Satisfied/Dissatisfied	Ideal Self
-.3196	Mature/Immature	Typical Manager
-.3120	Tolerant/Prejudiced	Typical Manager

Factor 9 (1.59%) Realism-Ideal and Real Self

.5996 Idealistic/Realistic	Real Self
.5628* Idealistic/Realistic	Ideal Self

Factor 10 (1.55%) Competitive-Real and Ideal Self

-.5432* Competitive/Non-competitive	Real Self
-.5291* Competitive/Non-competitive	Ideal Self

Factor 11 (2.22%) Pride, Real and Ideal Self

.5913 Humble/Proud	Real Self
.5528 Humble/Proud	Ideal Self

A brief glance at these factors answers our concept independence question. The real self image is isolated in three factors (3, 6, and 7); the ideal self in only one factor (1); and the typical manager in two (2 and 5). The other factors are composites of the three concepts: ideal and real self (factors 4, 9, 10 and 11); and ideal self and typical manager, (factor 8). Perceptions of real self and typical manager do not appear to be correlated.

The first three factors represent 25.57% of the total variation explained (43.41%) in the overall analysis. Interestingly enough, these three dominant factors are all 'pure' cases encompassing items from only one of the three concepts.

Factor 3, which we have labeled "Personal Attributes of the Real Self" is primarily composed of items which describe the individual as he appears in his dealings with others - items such as mature, cooperative, sincere, poised, efficient and enthusiastic.

Two other 'pure' real self variable sets describe different aspects of the student image. Factor 6 emphasizes the emotional and personal aspects of personality, while Factor 7 links absence of inhibition with 'daring'.

The right hand side of the 'pure' ideal self factor, Factor 1, is dominated by "Persuasive/Mature Leadership" characteristics: poised, sincere, enthusiastic, leads, mature, cooperative, efficient, confident, original.

The typical manager factor holds eight traits in common with the ideal self factor and most relate to leadership -- leads, mind of own, poised, etc. Significantly omitted from the typical manager's portfolio are a number of personal traits present in the ideal self image (sincere, cooperative, tactful, friendly, flexible, tolerant, frank). The personal traits of the typical manager, although expressed in different adjective pairs, appear as a separate factor, "The Sensitivity and Sincerity of a Typical Manager", Factor 5, made up of the following items: sensitive, sincere, patient, personal, not cynical. Although Factor 3, "Satisfaction - Ideal Self and Typical Manager", is a composite of ideal and typical manager descriptors, all but one of the items comprising the factor are related to the typical manager. Note that 'satisfied'/'dissatisfied' is also used as an adjective describing the ideal self. Evidently students separate several identifiable facets of the typical manager's make-up, while their ideal self concept strives to incorporate all facets in an integrated whole.

The remaining factors derived from the semantic differential data represent less than 3% of the variation explained. However they do deserve note.

Factor 4, which we have labelled "Cynicism in Real and Ideal Self', is composed of four logical combinations and one surprise. The four easily linked adjective sets are the cynical (real and ideal) and hard and impatient (ideal). What is curious on first blush, is the inclusion of 'anxious' in the real image contribution to this cynicism factor. Closer analysis suggests that student cynicism may be attributable to anxiety - a retrospectively

plausible hypothesis.

Factor 9, 10, and 11 are all uni-dimensional, i.e., incorporate only one significant concept. The structure of these factors suggests that student real and ideal images converge in regard to realism, competiveness and pride.

An additional overlap in perceptions is revealed in Factor 8 (already described in terms of the perceived attributes of a typical manager). Apparently, the student sensitivity to dissatisfaction as an element in the ideal profiles parallels concern with this same dimension in the typical manager concept. Note that typical manager dissatisfaction is coupled with tactlessness, immaturity and prejudice.

Opinions About Management

The Personal Opinion Questionnaire included as section III of the Pre Term questionnaire was designed to measure attitude and belief structures which affect student perceptions of the managerial profession. The questionnair was developed by Edgar Schein to compare executive, faculty and student attitudes toward management at the Sloan School of Management.[1] It was used in this study to describe and compare student opinions about management at various points in the educational process. Schein used factored response data obtained using this instrument to assess student attitude change over a two-year period and to compare the directions of these shifts in student attitudes with faculty and executive attitude positions.

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[1] Edgar Schein, "Attitude Change During Management Education", Administrative Science Quarterly, Vol. II, No. 4, March 1969, pp. 601-628.

The original Personal Opinion Questionnaire was designed to measure attitudes relating to the following areas of management concern:

1) Government-business relations
2) Labor-management relations
3) Areas of corporate responsibility
4) Superior-subordinate relations
5) Theory of how to organize and manage
6) General cynicism-idealism about all aspects of business
7) Cynicism-idealism about how to rise in organizations
8) Faith or confidence in workers
9) Attitudes toward individual versus group incentives and decisions
10) Large versus small business[1]

The common factor analysis technique employed in our study[2] produced twelve factors, of which nine relate directly to Schein's management areas. Our factor 2 (unionism and protectionism) encompasses two Schein areas: Government-business relations and labor-management relations.

Our analysis also produced factors dealing with the employee's private life ("Separation of Private and Corporate life", Factor 7), cynicism regarding management ethics in the business setting (Factor 9) and the role of the specialist in industry (Factor 12).

The factor analysis reported by Schein included scales representing his ten areas of interest. However, his analysis produced six additional factors which were not replicated by

[1] Ibid., pp. 601-628.

[2] Three factorial techniques were tried in an attempt to maximize the amount of total variation explained, principal component with an eigenvalue cutoff less than or equal to 1, scaled image analysis, and common factor analysis. The latter explained the largest percentage of variation. Factors were similar in all cases.

our analysis: "Relations to Society" which dealt mainly with the relationship between business, consumers and products, "General Conservatism" which is self explanatory, "Change and Cosmopolitanism" concerned largely with movement and change, "Belief in Group Incentives" including items concerned with the value of piece work systems and "Interpersonal Orientation", attitudes toward sensitivity in the managerial role. Schein also obtained a large cluster which he labeled "Miscellaneous".

While it would be interesting to extend the comparison between analyses, differences in factorial approaches make parallel evaluations difficult. We chose to accept factors on the basis of objective statistical criteria based on a mathematical construct. Schein, on the other hand, chose a more subjective approach to factor interpretation.

> "A purely statistical criterion gives fewer factors, but at the cost of blurring content categories. We therefore retained several scales which reflect clear content areas but which are factorially less clear."[1]

The absence of published data and current unavailability of Schein's original factor item loadings further complicates the process. It is, however, reassuring to note the overall consistency between the results obtained in the two studies.

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[1] Ibid., p. 606.

This conformity is especially noteworthy when we consider the time gap between the studies. Schein reported his results in 1962, and this analysis was completed in 1971.

This analysis is based on the responses of 442 graduate business students from Boston College, Amos Tuck,Southern Methodist, Sloan and Stanford who answered all 94 items on the Schein questionnaire. Note that in descriptions of common factorial results, the asterisk convention will change due to the lower cutoff value applied to variable loadings. A variable loading will be preceded by an asterisk in common analyses if the variable loads on two factors at .2000 or higher. Twelve factors explained 27.45% of the total variation in these data.

Factor 1 (3.46%) Cynicism About Business in General

.5277	Industry's basic idea is to drive you as hard as it can and give you as little as possible.
.5287	Many employers think only of their profits and care little for their employees' welfare.
.4733*	It is the tough, driving, impersonal man who really gets ahead in industry.
.4185	The good businessman is basically a cold, calculating kind of person.
.3622	Many managers are suspicious of their business associates.

.3504	Most large corporations are placing more stress on the "corporation loyalty" of the employee than on his individual growth.
.3499*	The best way to get ahead in business is to move from organization to organization.
.3345*	The one most important factor contributing to a manager's advancement is his ability to place the welfare of the company above that of his friends and colleagues.
.3089	A corporation with a good public image can sell even an inferior product.

Factor 2 (3.81%) Unionism and Protectionism

-.5669*	A man who is willing to work hard in industry does not need a union to protect him.
-.5477*	Management will usually do what is best for its employees without outside influence from unions.
-.5471*	Management will usually do what is best for its employees without outside influence from the government.
-.5115	The legal system of this country is generally slanted against big business.
-.4818*	The welfare of society is best achieved if all businesses pursue profit to the best of their ability.
-.4654	Government should be headed by men trained in business techniques and sympathetic to the cause of business.
-.4518	Private enterprise working through a market economy provides the most equitable distribution of society's goods and services.
-.4038	Government competition with private enterprise is unfair and should be eliminated.

-.3967	Governmentally operated projects cannot compete with private enterprise because they are less efficient.
.3758	"Price fixing", contract rigging, and other similar activities by leading American business firms show that the Federal Government must take a more active role in the policing of private enterprise.
-.3522*	Managers usually deal with people in a democratic manner.
-.3522	Present tax laws tend to stifle capital expansion by business more than they encourage it.
.3311*	The average employee's standard of living would not be what it is today had it not been for the efforts of labor unions on his behalf.
-.3216	The most important objective of a company is to provide its stockholders with as high a return on their investment as is possible.

Factor 3 (2.74%) Corporate Social Responsibilities

.6067	Corporations have a definite obligation to support liberal arts colleges.
.6051*	Corporations have a definite obligation to be actively involved in community affairs.
.5622	Corporations have a definite obligation to give money to charity.
.4198*	The most important objective of a company is to allow for the maximum development of its employees as individuals.
.4151*	A corporation must be responsible for the health and welfare of its employees and their immediate families.
.3302	Corporations have a definite obligation to take a stand on political issues.

Factor 4 (2.13%)	Small vs. Large Corporations
-.6448	Large c rporations create more opportunities than small companies for the individual to maximize his talents.
-.6268	A large corporation is generally a more desirable employer than a small company since it offers security, regular advancement, and a wider selection of jobs.
.6154	A small company is generally a more desirable employer than a large corporation because it offers greater opportunity for the individual to maximize his talents.
.5105*	A large corporation tends to suppress individual creativity.
Factor 5 (2.42%)	Authoritarian Structure
.5119	A clearcut hierarchy of authority and responsibility is the cornerstone of the business organization.
.4534	In industry there must always be unity of command so that individuals will not be subjected to conflicting authority.
.4094	The primary purpose of a training program for college graduates should be to indoctrinate them with the organization's basic philosophy, goals, and ways of doing things.
.3978	A firm separation between staff and line functions is essential to efficient company performance.
.3648	Management is primarily a process of understanding and adapting to economic forces.
.3451	Responsibility should never exceed authority because the individual cannot be held responsible for what he does not control.
.3026*	Piece work systems are good for company morale because they stimulate high productivity.

Factor 6	(1.96%)	Committee vs. Individual Management
	.5361	Most organizations would be more effective if they used committees to make some of their decisions.
	-.4780	The "committee way of life" in an organization often results in a good bit of wasted time.
	.4200	Individual decisions cannot be consistently as sound as group decisions.
	-.4072	The quality of individual decisions is generally higher than the quality of group decisions.
	-.3308*	The good manager is willing to make decisions which will hurt others.
Factor 7	(1.84%)	Separation of Private and Corporate Life
	-.6107	The private life of an employee is properly a matter of direct concern to his company, for the two can never be completely segregated.
	.5802	The private life of an employee should be of no direct concern to his company.
	.4537*	Piece work systems are bad for company morale since they force competition between fellow workers.
	-.3464*	Piece work systems are good for company morale because they stimulate high productivity.
	.3302*	Nowadays when industry hires a new manager his whole family should be screened as an indication of his potential for advancement.
Factor 8	(1.94%)	Theory X vs. Theory Y Management
	.4809	The good manager should rely on explanation and persuasion rather than direct orders.

.4762	The good manager should always be sensitive to the feelings of his subordinates.
.4482	To succeed in business one must be able to take criticism without being hurt by it.
.4069	The best kind of emotional relationship between a superior and a subordinate is an open one in which each party feels it can "level" completely with the other.

Factor 9 (1.88%) Cynicism Regarding Management Ethics

-.5367	Religious teachings cannot be strictly observed in the business setting.
-.4870	The good manager must be willing to compromise his own ethics and morals to some degree in order to get his job done.
-.4578*	Most managerial jobs require a person to compromise his ethics or morals to some degree.
-.3350	Some degree of cynicism is a valuable attribute in a manager.
-.3068*	The good manager is willing to make decisions which will hurt others.

Factor 10 (1.79%) Capabilities of the "Average Worker"

-.4896*	The average worker in industry prefers to avoid responsibility, has little ambition, and wants security above all.
.4535	The average worker in industry is capable of exercising self control.
.4274*	Most workers in industry can be trusted enough to be allowed to set their own production goals.
-.4141*	The average worker in industry has an inherent dislike to work and will avoid it if he can.

Factor 11 (2.12%)	Cynicism Regarding Personal Advancement
.5926	The man who gets ahead in industry is the man who knows the right people.
.5533*	The man who gets ahead in industry is the man who knows how to "play politics".
.5381	The man who gets ahead in industry is the man who has someone sponsoring him.
.3648*	A wife's social grace and attractiveness play a significant role in her husband's rate of advancement.
.3205	The successful manager is a "jack of all trades and a master of none".
.3030*	A young man entering industry should be careful in selecting a wife to make sure she will fit into his career plans.
Factor 12 (1.37%)	**The Role of the Specialist in Industry**
.4404	The successful manager is the one who becomes an expert in his own particular functions.
.3260	The best way to get ahead in management is to have maximum experience in one field like finance, production, or marketing.

It is difficult to add significantly to the obvious structural characteristics of these twelve factors. The names assigned to each factor reflect our perceptions of the primary concept associated with each grouping.

Factor 1 which we have labeled "Cynicism about Business in General" reflects the extent to which respondents view "the organization" as cold, impersonal, manipulative and insensitive. The internal linkages are clear and concise.

Factor 2 combines several opinions regarding the value of unions, the profit motive, and government intervention in business. This factor clearly isolates the economic implications of management ethics from the social ramifications covered by Factor 3.

Factor 3 neatly encompasses the social, welfare, personnel development, and political responsibilities of corporate management. It is interesting to note that corporate responsibility for employee health and welfare appears in this set rather than in Factor 2. Welfare is perceived as a social rather than an economic issue.

The small versus large company issues circumscribed by Factor 4 divide neatly into pro-small (positive) and pro-large (negative) segments.

The otherwise clean hierarchic structure orientation of Factor 5 is somewhat muddied by the inclusion of "economic forces" and "piece work" incentives in the last two variables. While the economic items can be encompassed by expanding the concept to include organization goals and structure, the linkage to the piece work concept continues to elude us.

Factors 6 and 7 are self explanatory except that Factor 7 might have been labeled the "Worker as an Individual" in an attempt to better incorporate piece work items which may be questioning the legitimacy of pitting workers against each other in an "exploitation" of personal values for the corporate benefit.

Factor 8 provides an insightful combination of supervisory sensitivity and worker maturity (ability to take criticism) in a concept that we have labeled "Theory X" (workers fundamentally negatively motivated) and "Theory Y" (workers basically positively motivated).

The personal and moral aspects of managerial ethics are combined in Factor 9.

The capabilities and value of the "average worker" as opposed to "unions" (Factor 2) are cleanly isolated by Factor 10.

Factor 11 emerges as our "how to succeed" opinion set. It is interesting to note the appearance of the two "wife selection" items in this factor while "family privacy" considerations are linked to other company decisions in Factor 7. The relevance of family is determined by the corporation, but the choice of its composition is still in the hands of the individual, albeit the individual forewarned of the implications of his decision.

Opinion regarding the merits of specialization fall out in orderly fashion in the two items of Factor 12.

Factor Analyses of Data from the Course Evaluation Questionnaire

This section describing Course Evaluation factor analyses will be divided into three parts paralleling the three major sections of the Course Evaluation Questionnaire and focussing in turn on learning outcomes, classroom environment, and student perceptions of the professor.

Learning Outcome Perceptions

The responses to "Ability to..." questions from the Course

Evaluation Questionnaire were used to develop factor scores, which were then applied to learning outcome data from the Pre- and Post Term Questionnaire. As a result of a printing error, one item which appears in the learning outcome set in the Pre- and Post Term Questionnaires, "Ability to formulate plans" was not included in the Course Evaluation Questionnaire. Therefore, wherever factor scored Pre and Post Term learning outcomes are employed, the item is dropped from the analysis.

Student responses indicating perceived change along the learning outcome dimensions were factor analyzed using principal component analysis of the Course Evaluation learning outcome data with an eigenvalue cutoff at 1.0. The question used to obtain these data was:

> Indicate on a 7-point scale the amount of change in yourself that took place as a specific result of this course. (1 = no change, 7 = much change).

Twenty items detailed in the Appendix followed.

Four factors explained 65.0% of the total variation in the data. The numbers in parenthesis represent the percentage of total variation explained by each factor. The assigned factor names reflect our assessment of concepts embedded in each factor.

Factor 1 (20.68%) Interpersonal Relations

.7973	Ability to sell ideas
.7829	Ability to communicate ideas
.7796	Ability to work with people
.7248*	Attitudes toward people
.5390**	Personal attitudes and values

Factor 2 (17.77%) Managerial Skills

-.8059	Ability to analyze problems
-.7519	Ability to apply techniques
-.6784	Ability to identify problems
-.6078*	Ability to think creatively
-.5852	Ability to do research
-.5819*	Ability to make decisions
-.5278*	Ability to formulate policy

Factor 3 (12.04%) Knowledge of Business

.8588	Knowledge of business principles
.7452	Knowledge of management techniques
.6149**	Attitudes toward business

Factor 4 (14.51%) Personal Insights

-.7202	Understanding own abilities and limitations
-.7136	Goals and aspirations for own career
-.6720	Self confidence
-.6523**	Personal attitudes and values
-.5048**	Attitudes toward business

In examining these factors, it is important to remember that the learning outcome variables were the central focus of our study of student change in the graduate business school environment. The item set was designed by administrators and faculty at the Sloan School of Management with the object of quantifying the types of change that might occur as a result of student exposure to faculty, other students, the educational program and extra-curricular activities associated with graduate management education. The results of the principal component analysis of the learning outcome data were thus of great concern to the research staff. We were frankly delighted by the clarity of the factors that emerged and the high percentage of variation (65%) explained by the analysis.

Factor 1 involves a strong sense of social sophistication,

persuasiveness and skill in interpersonal relations. The three highest ranking variables all deal with persuasive group interactions, communicating, selling, (inducing change), and working with others. The two remaining variables extend the concept to cover attitudes and values affecting one's orientation toward other people.

Factor 2 focusses on the individual's ability to function effectively in various managerial capacities. The managerial skills encompassed by this factor are the makings of an executive recruiter's dream - - the manager who has the ability to think creatively, formulate policy, identify and analyze problems, do research, apply appropriate techniques and make decisions.

Factor 3 isolates three cognitive prerequisites of management practice - knowledge and attitudes as opposed to the skills delineated in Factor 2.

The fourth factor combines four dimensions of student self perceptions, aspirations and values with basic attitudes toward business. The four highest loading variables on Factor 4 involve expected changes in highly personal attributes - gaining a better understanding of abilities and limitations, developing more clearcut career goals, changing personal attitudes and values and acquiring self confidence. These variables relate to wholly subjective dimensions of change in contrast to the objectively measurable skill and knowledge dimensions associated with the other three factors.

Classroom Environment

Student perceptions of the classroom environment were assessed through twenty-eight items relating to student/faculty interactions in the classroom. Principal component analysis with an eigenvalue cutoff at 1.0 was applied to responses to the question:

> On a 7-point scale, check the extent to which each item applies to this course. (1 = does not apply, 7 = applies very much)

The twenty-eight items following the question are detailed in the Appendix.

Six factors explaining 57.73% of the total variation in the data were produced by the analysis. The numbers in parenthesis represent the percentage of the total variation explained by each factor. Asterisks note variables loading on more than one factor at .4000 or higher (the principal component convention established earlier).

Factor 1 (16.38%) Motivation and Stimulation

.7385	Professor motivates students' interest in the material
.7378	Professor forces students to re-evaluate their thinking
.6943	Professor offers new approaches and ideas
.6917	Professor stimulates students to think about issues
.6700	Class sessions are always interesting
.6648*	Professor makes material relevant
.6430	Students work on real world problems
.5909*	Professor encourages students to evaluate other's ideas

Factor 2	(6.18%)	Course Coverage
-.6339		Student is forced to integrate material for himself
-.6178		The material is seldom fully covered
Factor 3	(10.40%)	Professor Flexibility
-.6177		Professor is available for outside assistance
-.6156		Students are allowed to work at their own pace
.6104		Professor pressures students to get work in
-.5950		Students are encouraged to work on their own topics
.5745		Professor places a great deal of emphasis upon grades
-.5659		Professor is willing to adapt to meet student needs
.5519		Professor is always criticizing students
Factor 4	(8.26%)	Feedback
-.7581		Students know when professor is pleased with their work
-.7375		Professor gives students detailed comments about their work
-.5758*		Professor encourages student reactions to the course
Factor 5	(5.24%)	Application versus Theory
-.7238		Professor emphasizes applied vs. theoretical
.5849*		Material is too advanced for your level of understanding
Factor 6	(11.27%)	Course Organization
.6892		Professor is well prepared for class
.6068*		Professor gives clear explanations of material
.6875		Professor has a clear plan for semester's work
.5717		Texts and class sessions are well integrated
.7245		Course is highly structured

While those concerned with this study have been most interested in the learning outcome dimensions, faculty and students have shown much greater concern for the classroom

environment factors as measures of teaching effectiveness. The variables on which these factors are based represent many of the traditional items commonly used in student evaluations of faculty performance.

The six factors provide a clearly delineated set of student concerns with classroom interaction. Ranked by variance explained, the students place emphasis on: the professor's ability to motivate and stimulate inquiry, professor preparation and course organization, professor flexibility and supportiveness, feedback from and to the professor, and course coverage and content.

Factor 1 focusses on the professor's ability to motivate, stimulate thinking about new issues and re-evaluation of old concepts, and maintain interesting class sessions. The high value currently attached to "relevance" is clearly indicated by the inclusion of references to "relevant material" and "real world problems" in this factor. Motivation and interest are directly linked to the "real world relevance" of material presented or, more correctly, the professor's ability to make course content appear relevant.

The second factor isolates two negative dimensions of course content -- absence of integration and superficial or incomplete coverage. Factor 5 attacks content from a different point of view -- amount of theory and level of complexity. The variables combined in this factor signify the student perception that theory is more difficult (advanced) than application.

Factor 3 identifies seven areas in which professor flexibility (or lack of same) affects the classroom environment. The signs associated with variables in this set establish two contrasting images. On the one hand we have the professor who is available for outside assistance, allows students to work at their own pace on their own topics and is willing to adapt to meet student needs. On the other is the faculty member who pressures students to get work in, places great emphasis on grades and is always criticizing students.

Factor 4 reveals the student's need for two-way communication with the instructor: from professor to student via detailed comments on their work and praise when warranted; from student to faculty member regarding reactions to course.

Factor 6 deals with professor preparedness, organization and ability to provide well-structured integration. It is interesting to contrast the somewhat anal compulsive rigidity suggested by Factor 5 with the easy going flexibility implied by Factor 3. It would be ironic if the faculty member's ability to get high marks from his students were to depend on his skill in planning, structuring and integrating a course in which each student does his own thing on his own time schedule without faculty pressure or criticism.

Douglas Hall, whose revised version of Fleishman's Leadership Opinion Questionnaire became the prototype for our classroom environment variables, has reported the results of his research (using a somewhat similar set of variables) in "The Effect of Teacher-Student Congruence Upon Student Learning"[1] His factors incorporate the following concepts:

[1]Hall, Douglas T., "The Effect of Teacher-Student Congruence Upon Student Learning" presented at the annual meeting of the American Educational Research Association, Chicago, February 10, 1968.

('He" refers to the professor or instructor.)

1. Interaction facilitation ("He conducts the class as a discussion group")
2. Willingness to change ("He accepts suggestions for changes")
3. Student Autonomy ("He lets a student do the work in the way the student thinks best")
4. Feedback on student work ("He rewards students for a job well done")
5. Personal rapport with students ("He helps students with personal problems")
6. Preparation ("He is well-prepared for class")
7. Task concern ("At the beginning of the semester he talks about how much should be done")

Instruction facilitation, student autonomy, feedback on student work and preparation all have parallels in our factorial results. Willingness to change, personal rapport with students and task concern factors are based primarily upon items which did not appear in our questionnaire.

During the course of our research we found many institutions using course evaluation questionnaires which included measures of course content and structure similar to those employed here. However, very few included proactive verbal stems such as our "Professor encourages....Professor motivates..."

In their study, "Effective University Teaching and Its Evaluation"[1] Milton Hildebrand and Robert C. Wilson present five scales making up the 'Components of Effective Teaching as Perceived by Students':

1. Analytic/Synthetic Approach
2. Organization/Clarity
3. Instructor/Group Interaction
4. Instructor/Individual Student Interactio
5. Dynamism/Enthusiasm

Our Factor 1, Motivation and Stimulation, includes items quite similar to Analytic/Synthetic approach, and its professor action-oriented variables reflects much of their Dynamism/ Enthusiasm factor. Hildebrand and Wilson's Organization/ Clarity factor relates directly to our Course Organization factor and, although they divide faculty-student interaction into two sub sets, the components of these factors closely parallel the items in our Professor Flexibility factor.

The underlying similarities between the results obtained in these diverse studies give credence to our claim that a consistent set of dimensions can be used to describe the educational process in a variety of institutions under diverse conditions.

Hildebrand and Wilson make a similar observation:

> "Many researchers have sorted individual items describing aspects of effective teaching into related

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[1] Milton Hildebrand and Robert C. Wilson, "Effective University Teaching and its Evaluation" in Kenneth Eble, ed., The Recognition and Evaluation of Teaching, Chapter 7.

> groups, thus identifying basic components, dimensions or scales of such teaching. Teacher rating forms developed by students commonly do the same. Scales have been variously determined by subjective examination of a list of items or by factor analysis, which establishes mathematically the tendency of responses to the various items to associate in clusters. The number of scales developed in reports we have seen ranges from 4 to 13. Nevertheless, 4 to 5 particular scales (i.e., knowledge, presentation, relation with students, enthusiasm) appear rather consistently, even though the terminology differs. Our scales are generally consistent with those of previous studies.[1]

Perceived Professor Traits

At the end of each semester or term students were asked to describe their professors in courses they had just completed along the same adjective pair dimensions used on the Pre Term Questionnaire to describe student perceptions of self, ideal self and a typical manager. An additional adjective pair 'Optimistic/Pessimistic' was included in the faculty list but not in the Pre-Term Questionnaire.

Responses obtained from these semantic differential sets were analyzed using principal component analysis with an eigenvalue cutoff at 1.0. The actual wording of the question was:

> Using the adjective scales below, describe the professor in this course.

Seven factors explained 64.17% of the total variation in the data. The numbers in parentheses

[1] Ibid, p. 95.

represent the percentage of the total variation explained by each factor. Asterisks identify variables loading on more than one factor at .4000 or higher. The double asterisk notes a loading on more than one factor at .5000 or higher.

Factor 1 (10.86%) Satisfaction/Maturity

-.7330	Satisfied/Dissatisfied
-.7029	Mature/Immature
-.6561	Tactful/Tactless
-.6085	Optimistic/Pessimistic

Factor 2 (17.58%) Leadership

-.8758	Follows/Leads
-.8410	Easily Influenced/Mind of Own
-.7829	Lacks Confidence/Confident
.7104	Relaxed/Anxious
-.6825	Humble/Proud
-.6736	Awkward/Poised
-.6270*	Emotional/Unemotional
.5801	Competitive/Non-competitive
.5532	Efficient/Inefficient
-.5289	Inflexible/Flexible

Factor 3 (8.85%) Hardness/Cynicism

.7747	Soft/Hard
.6464	Not Cynical/Cynical
.6386	Feels Inferior/Feels Superior

Factor 4 (7.70%) Creativity

-.7441	Inhibited/Uninhibited
-.7148	Unoriginal/Original
-.6237	Impersonal/Personal

Factor 5 (4.63%) Objectivity/Realism

.7327	Subjective/Objective
.6333	Idealistic/Realistic

Factor 6 (5.28%) Daring

.6700*	Cautious/Daring
.4197	Friendly/Unfriendly

Factor 7 (9.27%) Openness

.7266	Guarded/Frank
.6878*	Insincere/Sincere
.5426**	Insensitive/Sensitive

In the following discussion of factor content, we have taken the liberty of interpreting the flattering adjective pair components in each factor. However, please keep in mind that actual responses reported in later analyses may just as easily accentuate the opposite side of the adjective scales.

Factor 1 which we have named Satisfaction/Maturity links variables measuring the extent to which a faculty member is perceived as 'satisfied', 'mature', 'tactful' and 'optimistic'. The isolation of these four dimensions as a separate concept distinct from the 'self confidence' component of Factor 2 is noteworthy. The fact that 'maturity' is linked to 'satisfaction' contrasts with the apparent high level of dissatisfaction exhibited by many students who consider themselves to be mature far beyond their years. Commenting on this point we showed this factor to one of our angry young friends who observed -

> "Not inconsistent at all. 'Mature' is a negative word. We're sick of being told we'll think differently when we mature. For 'mature' substitute 'over the hill'. Replace 'satisfied' with 'self-satisfied', 'tactful' with'dis - honest' -- if you're tactful you don't say what you think. Over 35 optimism is more like blind faith in the establishment. So there it is."

Taking the right side of the highest loading adjective pairs in Factor 2 and following the signs on the other variables we find that the faculty member who 'leads', has a 'mind of his own', is 'confident', 'relaxed' but 'poised' and 'unemotional'. He is also 'competitive', 'efficient', 'flexible' and understandably 'proud'. The breadth of items covered by this composite suggests many labels for this factor. We believe the overall image of "leadership" prevails.

You may disagree. Remember all names assigned to factors are based on our subjective interpretations of the factor composition and variable loadings.

Factor 3 presents the interesting student insight that the professor who is 'not cynical' must also be 'soft' and 'feel inferior' while the hard cynic 'feels superior.'

The implications of Factor 4 that the 'original' faculty member will also be 'uninhibited' and 'personal' is somewhat more easily accepted than the following contentions (Factors 5 and 6) that 'idealists' are 'subjective' and 'cautious' professors are more apt to be 'friendly'.

Factor 7 offers the interesting assertion that the 'frank' instructor will also be 'sensitive' and 'sincere'. We have chosen to label this concept 'openness'. (It is probably just as well that we didn't show this factor to our angry young friends.)

The seven composite personality traits identified by this analysis are not as easily labeled as the earlier student personality structures. However it is important to relate them to the earlier real self, ideal self and typical manager analysis based on responses from the Pre Term Questionnaire. The intent is to determine if a common structure underlies student self perceptions, aspirations, managerial stereotypes and their impressions of faculty members. Previous analyses revealed significant overlaps between student ideal self descriptors and their perceptions of typical manager traits. We must now determine if these same dimensions can be used to

describe faculty traits.

The primary difference between analyses is that seven distinct factors emerged as faculty traits from a synthesis of 31 faculty descriptors, while the earlier analysis focussed on a combined population of 90 adjective pairs of which 30 were applicable to each of the three concepts. The factors generated by the earlier analysis produced only one isolated ideal self concept, three pure real self factors and three typical manager descriptors.

Despite the different analytic approach several of the seven faculty dimensions 'Satisfaction/Maturity', 'Leadership', 'Hardness/Cynicism', "Creativity', 'Objectivity/Realism', 'Daring', and 'Openness', parallel those derived in the earlier analysis.

Factor 2, 'Leadership' that dominates the analysis by explaining 17.58% of the total variation, has five items in common with both the pure typical manager factor 'Cold/ Confident Leadership' and the pure ideal self factor 'Persuasive/Mature Leadership': 'leads','mind of own', 'confident', 'poised', and 'efficient'. The ideal self concept also shares the 'flexible' dimension with Factor 2. Four dimensions not found in either the typical manager or ideal self leadership factors are part of the faculty leadership traits. These are: 'relaxed', 'proud', 'unemotional', and 'competitive'. Three of these four dimensions ('proud',

'non-competitive', and 'unemotional') are incorporated in other real self, or real/ideal self combinations generated in the earlier analysis.

Professor personality trait Factor 1 'Satisfaction/ Maturity' resembles Factor 8 of the Pre Term semantic sets 'Satisfaction - Ideal Self and Typical Manager'. The sole significant difference is the substitution of 'pessimistic' in the faculty version for 'prejudiced' in the Pre Term concept.

Likewise Factor 3 'Hardness/Cynicism' relates easily to the previous 'Cynicism in Real and Ideal Self' factor. Factors 5 and 6 'Objectivity/Realism' and 'Daring' have their counterparts in 'Realism - Ideal and Real Self' and 'Daring' Uninhibited Real Self'. Factor 9, 'Openness', does not have a direct parallel in the real, ideal and typical manager concepts.

In an earlier study, Edgar Schein and Douglas Hall used similar adjective pairs to determine salient characteristics of "good" and "poor" teachers as perceived by two sets of students at the Sloan School of Management.[1] Three factors derived from 36 adjective pairs were labeled 'competence, potency and supportiveness'.

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[1]From "The Student Image of the Teacher", Parts I and II, Edgar H. Schein and Douglas T. Hall, a working paper #231-66 at the Alfred P. Sloan School of Management, Cambridge, Mass.,1966.

An unpublished course evaluation report prepared by Bertram Shlensky (Ph.D. Sloan School) using 60 semantic differential adjective pairs similar to those in the Schein and Hall study, yielded seven professor personality factors which Shlensky called 'competence, supportiveness, integrity, interest in students, potency, originality and toughness'.[1]

It is important that you note any differences of opinion that arose as you examined the semantic differential factors. It is expected that the combinations of adjectives may conjure up personality constructs different from those we have discussed. However the titles ascribed to the factors in this (and other) sections will be the identifications used to reference these concepts in later analyses.

Factor Analysis of Data from the Professor Pre Course Questionnaire

Principal component analysis of the Pre-Course Questionnaire was performed to establish a reduced data set for comparisons (via discriminant analysis) of faculty response at the five graduate business schools. The questionnaire was not divided into sub sections for this analysis. An eigenvalue cutoff at 1.0 was employed. All 82 items included in the Pre Course Questionnaire were inputted to the

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[1] From a conversation with the author and unpublished (and untitled) paper.

analysis. (A detailed listing of all questions is presented in the Appendix.) Seventeen factors explaining 91.50% of the total variation in the data were produced by this analysis. The numbers in parenthesis indicate the percentage of total variation explained by each factor.

The Pre Course questionnaire is composed of six separate sections which are divided into eleven logical units. In the following factor listings and discussions the item title to the left of the slash represents the questionnaire unit referenced, and the item title to the right of the slash indicates the specific variable in the questionnaire section referenced. For example, the first variable listed as a contributor to Factor 1 is given as .8616 Framework/ Economic viewpoint 'Framework'refers to the Framework for analysis unit of section 2 of the Pre Course questionnaire; 'Economic viewpoint' is one of four variables making up that unit. Most of the unit names (such as 'Framework' in the above example) are direct abbreviations from longer titles in the questionnaire. There are two exceptions. Section 3, which has no obvious title, on the questionnaire form, is composed of the familiar learning outcome "Ability to..." variables also found in student Pre Term, Post Term and Course Evaluation forms. We have therefore entitled section 3 "Learning outcomes". Likewise, section 4, is made up of "Learning Mechanisms", although no title label is apparent in the form.

Factor 1 (14.17%)	**Managerial Analysis**
.8616	Framework/Economic viewpoint
.8536	Learning outcome/Desire for continued learning
.8528	Learning outcome/Attitudes toward business and industry
.8152	External viewpoint/Political structure
.8106	Learning outcome/Attitudes toward people
.8023	Emphasis/Specific skill development
.7786	Learning mechanism/Student interaction with people from industry
.7506	Learning mechanism/Problem solving
.6198*	Framework/Organizational viewpoint
.5984	Learning outcome/Problem solving
.5805	Course content determined by the student
.5620	Emphasis/Quantitative approach
.5366	Underlying disciplines/Mathematics
Factor 2 (4.74%)	**Policy Planning**
-.8530	External groups/Federal government
-.7925	External groups/International organizations
.5090	Learning outcome/Student experience in planning
Factor 3 (5.38%)	**Internal Planning and Control**
.8164	Internal/Planning and control
.7783	External groups/Stockholders
.5553	Processes/Distribution and Transportation

Factor 4	(5.09%)	Inducing Change in Industry
-.7727		Learning mechanism/Projects in industry
-.7581		Learning mechanism/Short papers analyzing course material
-.7003		Learning outcome/Inducing change
Factor 5	(6.11%)	Personal Assessment
.7967		Learning outcome/Own abilities and limitations
.7016		Learning outcome/Risk taking
.6504		Learning mechanism/Independent research papers
.6222		Learning mechanism/Case studies
.5060		Learning outcome/Working with people
Factor 6	(6.67%)	Classroom Oriented Learning
.9174		Learning mechanism/Visiting lecturers
.9083		Learning mechanism/Class lectures
.8455		Learning mechanism/Simulated experiences
.7660		Learning mechanism/Class discussion
.5143*		Framework/Organizational viewpoint
Factor 7	(5.47%)	Industry and Union Relations
-.9362		External groups/Competitive industry groups
-.9253		Internal/Information systems
-.9194		External groups/Unions
Factor 8	(5.70 %)	Personal Learning Outcomes
.8837		Learning outcome/Career objectives
.8669		Learning outcome/Personal attitudes and values
.8107		Learning outcome/Self confidence
Factor 9	(2.58%)	Customer Behavior
.7950		Processes/Customer behavior
Factor 10	(7.50%)	Marketing Management
-.8080		Framework/Specific functional viewpoint
-.7598		External viewpoint/Organizational structure
-.7121		Internal/Marketing
-.6197		External groups/Capital sources
-.6043		External viewpoint/Social structure
-.5743		Underlying disciplines/Psychology
-.5234		External groups/Consumers
-.5113		Framework/Legal viewpoint

Factor 11 (5.03%)	Economic, Social and Political Research
.9050	Internal/Research and development
.8267	Processes/Economic, social and political change
.5714	Internal/Organizational development

Factor 12 (5.14%)	Applications of Quantitative Techniques
.8343	Underlying disciplines/Information and control theory
.8162	Learning outcome/Application of techniques
.6312	Emphasis/Application

Factor 13 (3.28%)	Learning to do Research
.7897	Learning outcome/Doing research
.5847	Learning outcome/Evaluating decisions

Factor 14 (5.65%)	Governmental Process Theory
-.8727	External groups/State government
-.6548	External groups/Community
-.6231	External groups/Local government
-.5718	Processes/Legislation
-.5249	Emphasis/Theory

Factor 15 (3.31%)	Subject Overview
-.7848	Emphasis/Subject Overview

Factor 16 (4.01%)	Industrial Relations
-.8607	Internal/Industrial relations
-.7695	Internal/Finance
-.7099	Underlying disciplines/Sociology

Factor 17 (1.63%)	Qualitative Approach
.4938	Emphasis/Qualitative approach
-.4733	Emphasis/Student interaction outside class

The factors identified by this analysis cover a broad range of educational concepts and learning structures.

The most general factors (1 and 15) are both concerned with subject overview. Factor 15 which we have labeled 'Subject Overview' is based on the single variable measuring the

emphasis given this type of material. Factor 1 is a conglomerate of specific learning outcomes, mechanisms, and viewpoints with a single underlying discipline, mathematics. It may be useful to reorder the components of this factor as follows:

Framework:	Economic and organizational viewpoints, political structure
Underlying disciplines:	Mathematics
Emphasis:	Specific skill development and quantitative approach
Course content:	Determined by student
Learning mechanisms:	Problem solving and interaction with industry
Learning outcomes:	Desire for continued learning, change in attitudes toward business and industry, and toward people, change in problem solving ability

Factors 2 and 4 are simple combinations of a desired learning outcome, 'student experience in planning' and 'inducing change', with reference to groups and learning mechanisms respectively. Three learning outcomes: 'recognition of own abilities and limitations', ability to take risk' and 'ability to work with people' are linked with two learning mechanisms, 'independent research papers' and 'case studies' by Factor 5. We sense a strong element of personal assessment in the learning outcomes associated with this factor; hence the name assigned to it.

Factor 13 combines two learning outcomes, 'doing research' and 'evaluating decisions', but has no correlated mechanisms

or references. While Factor 8 isolates three highly personal learning outcomes they do not share any common educational approaches.

Factor 6 presents an interesting combination of four highly correlated learning mechanisms: 'visiting lecturers', 'class lectures', 'simulated experiences', and 'class discussions'; associated with an 'Organizational viewpoint'.

Factors 10, 12 and 16 identify three discipline-based functional areas: marketing based on 'psychology', management science applications founded on 'information and control theory' and industrial relations and finance associated with 'sociology' as an underlying discipline. It is interesting to note the linkages of industrial relations and finance in Factor 16. The factor structure suggests a possible link between faculty treatment of employee relations and wage packages, pension plans, and fringe benefits directly affecting the profit and loss statement.

The separation of customer behavior processess (Factor 9) from the other components of courses in marketing management (Factor 10) deserves comment. We suspect that this differentation is based on the more theoretical, motivation research, orientation toward consumer behavior as opposed to the more pragmatic, perhaps even manipulative, set of the marketing management course. Since no single mechanism, discipline, or framework is consistently associated with the study of customer behavior we have no verification of this hypothesis in these factors.

The remaining factors (3, 7, 11 and 14) define closely associated process, reference and emphasis dimensions focussing on planning and control, industry and union relations, economic, social and political research, and governmental processes respectively.

Factor 17, explaining only 1.6% of the variation has no variable loadings above the .5 cutoff imposed when establishing the composition of other factors in this set.

Q factor analysis of underlying Pre Course structures at different institutions are described in Chapter 10.

Chapter 6

The Undergraduate Experience

"One of the benefits of a college education
is to show the boy its little avail."[1]

The undergraduate student population is the largest single group from which applicants to graduate programs in management are drawn. As such our interest in this population involves two managerial concerns: first, to establish the attributes, expectations, opinions, and perceptions of potential applicants to graduate management programs and second, to examine the consistency of these characteristics across selected undergraduate institutions. Our choice of institutions was designed to maximize potential differences since we wished to focus on contrasting attributes of students entering or graduating from particular undergraduate programs.

As noted in Chapter 4, the manager responsible for graduate education may view the output of the undergraduate programs as "raw material" input to his program or as potential customers for his brand of educational services. In either event, the graduate program administrator is directly concerned with the end product generated by his associates in the undergraduate sphere and appropriately attentive to their success in producing the characteristics and attributes which he values.

This chapter is organized around these managerial concerns. We begin with the characteristics of students attending seven undergraduate institutions and then focus on the characteristics and behavior of selected sub-groups within each institution.

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[1] R.W. Emerson, Conduct of Life (1860), "Culture".

Basic Characteristics of Seven Undergraduate Schools

The undergraduate programs selected for inclusion in this study were chosen on the basis of two criteria. The first was to obtain access to a cross section of undergraduate environments. Second, budgetary constraints dictated that the majority of the schools studied be easily accessed from Cambridge.

The final sample was drawn from the four classes attending Boston College, Brandeis University, Dartmouth College, Northeastern University, Southern Methodist University, and Wellesley College, and from the freshman class of Muskingum College during the fall of 1969 and the spring of 1970. Data were obtained using the Pre-Term and End-of-Term Questionnaire described in Chapter IV and reproduced in the Appendix. Before beginning our analysis it may be useful to summarize the specific characteristics that motivated inclusion of each of these universities in our study.[1]

Boston College

Boston College located in Chestnut Hill, Massachusetts approximately six miles from Boston is one of the oldest Jesuit sponsored universities in America. It is a large (7,000 students) coeducational institution offering a broad range of programs in five undergraduate schools.

Approximately sixty percent of the undergraduates are from Massachusetts and the majority of students are Catholic. There are no sororities or fraternities and approximately twenty-five percent of the students live in on-campus dormitories.

All programs of study lead to the B.A. and B.S. degrees. The school has an undergraduate honors program, a "junior year abroad", and a college work-study program.

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[1] Information presented in this section is drawn from publications of the colleges studied and Benjamin Fine, Barron's Profiles of American Colleges, 1971-72 edition, Woodbury, New York: Barron's Educational Series, Inc., 1971.

Brandeis University

Brandeis was our small (2,200 students) new, (founded in 1948) private (founded under Jewish auspices but non-sectarian) university. Brandeis is located on an extensive 400 acre campus ten miles west of Boston. The vast majority of students live in the modern residence halls on campus.

Brandeis offers a Bachelor of Arts degree in a broad range of major study areas including Afro-American studies, Arabic, archaeology, Hebrew, and Swahili language. The university has a strong international flavor. More than 10% of its students come from foreign countries and exchange programs are offered with several foreign universities.

Dartmouth College

Dartmouth, located in Hanover, New Hampshire one hundred forty miles northwest of Boston, was our Ivy League men's college. The majority of the Dartmouth undergraduates come from the northeastern United States. All students live on or near the campus with approximately eighty percent of the men living in dormitories. Fifty-five percent of the upperclassmen join fraternities.

Undergraduates receive the A.B.(or B.S. in engineering) degree in a broad range of major study areas. Modified majors involving two or more fields may be elected and some undergraduates select special fields of study. Recently inaugurated special programs include Public Affairs, Black Studies, Environmental Studies and Urban Studies.

Muskingum College

Muskingum was our small (1400 students) Protestant, midwestern college. Approximately fifty percent of the students attending Muskingum, located in the small college town of New Concord, Ohio, are Ohio residents. Over ninety percent of the students are Protestant.

Muskingum undergraduates receive the B.A., B.S. and B. Music degrees. Major fields include speech and dramatics as well as the normal liberal arts majors.

Northeastern University

Northeastern was our large (14,000 students) metropolitan university. A vast majority of students attending Northeastern are involved in the university's co-operative plan under which the students alternate two quarters of academic work with two quarters of employment in business during their four upper class years.

Northeastern's campus is located in Boston and more than fifty percent of the students commute to classes. B.A. and B.S. degrees are awarded through eight colleges that include business administration, criminal justice, engineering, nursing and pharmacy.

Southern Methodist University

S.M.U. located five miles from downtown Dallas was our Southern school. Fifty-three percent of its students come from Texas and eighty percent are Protestant. The school has a strong fraternity and sorority system with forty-seven percent of the women and thirty-nine percent of the men belonging to sororities and fraternities respectively. Fifty-five percent of the students live on campus.

S.M.U. offers a third year abroad and co-operative programs with Dallas based industries. Undergraduates may receive the degree of B.A., B.S., BBA, B.F.A., B.M. or B.S. in engineering. Forty-five percent of the undergraduates are enrolled in the humanities and science, twenty-four percent in business, nineteen percent in the arts, and twelve percent in engineering.

Wellesley College

Wellesley was our Eastern woman's college. Located on a five hundred

acre campus twelve miles west of Boston, Wellesley is one of the small (1700 students) "seven sisters". Almost all of the students live in thirteen resident halls on campus. The student body is drawn from all fifty states and thirty-five foreign countries. Undergraduates receive the B.A. degree in a broad range of majors. The school sponsors a summer internship program in Washington, a junior year abroad, and independent study and honors programs.

Table 6.1 provides further comparisons among these seven universities. This cross section of undergraduate institutions was selected to provide a range of college environments in which divergent student interests, attitudes, expectations and opinions might be found. The first question to be answered is therefore, what are the differences among students attending these seven institutions included in the study? (See Table 6.1 pages 6-6 through 6-9)

Before continuing you may wish to outline your a priori answers to this question and consider how your perceptions of these institutions influence your expectations. How would you expect students from each undergraduate program to respond to the Pre and Post-Term Questionnaire? Which students would you prefer to have as applicants to a Masters program you are managing? Why?

Comparative Conditions as the Academic Year Begins

Our first objective is to characterize the student populations at the seven undergraduate schools at the start of the 1969-1970 academic year. How are they alike? How are they different? Although primary emphasis will be on the second question, implicit answers to the first should not be ignored. Since these institutions were selected to obtain samples from allegedly divergent population sub-groups we would expect to find significant differences among the groups. Homogeneity among the presumed-to-be-widely-divergent populations on many dimensions would therefore be highly significant.

Table 6.1 Characteristics of Seven Undergraduate Schools[1]

College	Enrollment Men	Enrollment Women	Founded	Affiliation	Campus Acres	Campus Buildings	Libraries Books	Libraries Periodicals
Boston College	5,100	1,700	1863	Jesuit	200	40	752,000	4,568
Brandeis University	1,100	1,100	1948	Jewish	400	50	400,000	2,300
Dartmouth College	3,252	0	1769	None	175	100	1,000,000	11,000
Muskingum	719	686	1837	United Presbyterian	215	16	105,000	900
Northeastern University	9,400	4,600	1898	None	52	*	200,000	*
Southern Methodist	3,200	2,300	1911	Methodist Church	150	80	1,050,000	5,000
Wellesley College	0	1,750	1870	None	500	50	465,000	1,800

[1]Information presented in this table is drawn from Benjamin Fine, Barron's Profiles of American Colleges, 1971-72 edition, Woodbury, New York: Barron's Educational Series, Inc., 1971. Asterisks indicate incomplete information.

Table 6.1 Characteristics of Seven Undergraduate Schools (Continued)

College	Dormitories Men	Dormitories Women	Faculty Total	Faculty Ph.D.'s	Student/ Faculty Ratio	Student Pursuing Advanced Degrees	Costs Tuition	Costs Room	Costs Board	Costs Fee	Costs Expenses
Boston College	1,450	300	750	89%	9/1	76%	2,000	1,280		200	750
Brandeis University	1,600		400	80%	6/1	89%men 55% women	2,600	1,200		30	600
Dartmouth University	2,500	0	325	90%	10/1	90%	2,550	1,250		*	*
Muskingum College	1,166		80	50%	14/1	35%	2,084	990		60	650
Northeastern University	1,500	1,200	600	44%	10/1	65%	1,695	1,325		175	*
Southern Methodist	1,150	1,300	175	60%	14/1	65%	1,600	1,100		780	700
Wellesley College	0	1,750	180	70%	10/1	45%	3,400			40	500

Table 6.1 Characteristics of Seven Undergraduate Schools (Continued)

College	Applications	Admissions Accepted	Enrolled	Location	% living on Campus	% Receiving Aid
Boston College	5,680	2,130	1,605	6 miles west of Boston	25%	40%
Brandeis University	3,300	850	590	10 miles west of Boston	85%	33%
Dartmouth College	4,600	1,250	825	140 miles north west of Boston	100%	33%
Muskingum College	1,000	*	485	70 miles from Columbus, Ohio	100%	*
Northeastern University	14,000	7,200	3,600	Boston, Mass.	46%	*
Southern Methodist	2,936	2,306	1,466	5 miles from Dallas	55%	35%
Wellesley College	2,312	832	524	10 miles west of Boston	100%	30%

Table 6.1 Characteristics of Seven Undergraduate Schools (Continued)

College	average SAT scores Verbal	Math	1969 Football Win	Loss	Tie
Boston College	619	630	5	4	-
Brandeis University	675	675	No Team Since 1959		
Dartmouth College	650	700	8	1	-
Muskingum College	502	539	5	2	2
Northeastern University	500-525	500-525	3	6	-
Southern Methodist	526	561	3	7	-
Wellesley College	622	650	-----		

This analysis will be divided into four sections focusing respectively on: the demographics, expectations, semantic differential perception items, and personal opinion questions from the undergraduate questionnaire.

Demographic Differences

Demographic differences among students attending the seven undergraduate universities were evaluated using the simple chi-square procedure described in Chapter V. This analysis yielded significant differences at the .01[1] or .05 level based on (1) Father's education and employment, (2) Mother's occupation and education, (3) Student's religious affiliation and practice, (4) Work and military experience, (5) Undergraduate field of study, (6) Plans for graduate study, (7) Expected field of graduate study, (8) Employment expectations, and (9) Salary expectations after graduation and in twenty years.

Father's Occupation

The most significant difference in Father's Occupation responses is accounted for by the much larger proportion of Northeastern students whose fathers fall into the clerical and skilled worker categories in contrast to the generally higher proportion classified as professional or executive by students at other schools. A lower percentage of S.M.U. fathers are employed by government , schools, and universities or non profit agencies while a larger number of Brandeis and Wellesley fathers work for themselves or for a small company.

Father's Education

A greater proportion of Northeastern students (60%) place their father's education in the "less than high school" or "some high school; completed high school" range, while a larger number of Boston College fathers are classified

[1] See Ferber, Robert, Market Research, McGraw-Hill, New York, 1949, for an explanation of degrees of significance.

in the "some high school; completed high school" groups. Wellesley students indicate the largest proportion of fathers who had done graduate work (56%).

Mother's Occupation

A significantly greater proportion of Brandeis and Wellesley mothers are teachers while a higher percentage of Northeastern and Boston College mothers are placed in the "Clerical or Sales" category.

Mother's Education

As might be expected these occupational differences are paralleled by educational heterogeneity. Northeastern and Boston College students report more mothers in the "completed high school" category while a higher percentage of Wellesley mothers have completed college.

Religious Affiliation and Practice

The previously noted religious demographics are reflected in our samples. Dartmouth, Muskingum, Southern Methodist and Wellesley students are predominantly Protestant; Boston College and Northeastern students mostly Catholic (86 and 52% respectively), while 77% of our Brandeis respondents are Jewish.

Brandeis, Dartmouth and Wellesley students generally describe themselves as "not at all religious". The vast majority of respondents at the remaining schools consider themselves to be "Somewhat Religious". Muskingum College and Boston College (our two Church affiliated schools) have a slightly larger proportion in the "Very Religious" category, although the majority stays with the "Somewhat Religious" set.

Work and Military Experience

Differences in work experience distinguish Northeastern and S.M.U. from the other institutions based on responses indicating more than one full year of work experience. However, a very small proportion of the total population have had

significant work experience. A similar condition is noted with respect to service in the armed forces. Northeastern and S.M.U. have the highest percentages, and the vast majority have not yet served.

Undergraduate Field

Brandeis and Wellesley have proportionately more prospective psychologists-sociologists and anthropologists. Northeastern has by far the greatest number in engineering, and S.M.U. and Boston College (91% and 56% respectively) show the greatest interest in business.[1] Muskingum, Boston College and Northeastern produce more education majors, and Muskingum and S.M.U. have the greatest proportion of physical education majors. (In examining these data it is important to note that all fields are not offered at all schools, and the Muskingum sample is made up solely of freshmen).

Prospective Graduate Field

Current undergraduate fields of interest are reflected in the students' interests in graduate study. Thirty seven percent of the Wellesley women indicate interest in pursuing psychology; a large fraction of Muskingum, Wellesley and Brandeis students plan to continue in education; many Northeastern students will go into engineering and Southern Methodist students are predominantly interested in business.[1]

Interest in Advanced Study

Seventy percent of the Dartmouth respondents indicate they will pursue graduate study at the Master's degree level. At least 50% of the samples at all schools (except Muskingum freshmen who were understandably "undecided" on this issue) report considering a Master's degree. Interest in advanced study drops rapidly when doctoral work is mentioned. Dartmouth and Brandeis students

[1] This observation is biased by the fact that the S.M.U. undergraduate sample was composed of business majors.

(34% and 29% respectively) express interest in pursuing this advanced degree. If intentions become actions the other five schools will send an average of 9% of their graduates on for Ph.D.'s.

Career Interests

When students were asked where they would like to work on their first job two response patterns emerged. A significant portion of the students at Brandeis, Dartmouth, Muskingum and Wellesley (leading the pack) wish to work for government, education or in non profit agencies; while students at Boston College, Northeastern and SMU have a significantly higher interest in working for large companies. Boston College and Northeastern students appear torn between government; education-non-profit and big business. In this analysis, General Motors wins out! But not for long. When asked about twenty year job preferences, Wellesley and Muskingum students stay with the government, education, non-profit categories. SMU (65%) and Dartmouth (50%) lead the way to everyone's ultimate favorite, "working for self or a small company."

Salary Expectations

Southern Methodist students expect much higher salaries after twenty years than other students (70% expect to be in the $30,000 - $100,000 bracket by 1990). Wellesley women have by far the lowest expectations. 32% expect between $10,000 and $15,000 in 20 years; only 9% of the students at Wellesley, (as opposed to an average of 42% at other schools) expect to achieve salaries in the $30,000 to $100,000 range.

Expectations

The analysis of expectation data obtained from the seven undergraduate populations was based on factor scores derived from the educational and

career objective questions on the Pre-term questionnaire. You will recall that the factor analysis described in Chapter 5 produced eighteen factors:

- four based on expectations regarding the relative value of specific educational activities, outside activities, classroom activities, independent study, and opportunities for interaction;
- five indicating the relative importance attached to characteristics of the undergraduate institution: faculty and student characteristics, size of school-social climate, academic specialization, program attributes, and location;
- four summarizing student expectations regarding the impact of the undergraduate experience expressed in terms of change in: interpersonal relations, managerial skills, knowledge of business, and personal insight;
- five associated with the relative importance attributed to job characteristics including freedom-flexibility and challenge, time for personal life, earnings and advancement opportunities, prestige, and departmental efficiency-working conditions and training opportunities.

Discriminant analysis of the factor scored data led to the definition of four discriminant functions.[1] (The first three functions explain 93% of the total variation).

These discriminant functions separate the seven schools into roughly two groups. Group one consists of Brandeis (BRD), Dartmouth (DRU), and Wellesley (WEL); the prestigious private schools in our sample. Group two is made up of Boston College (BOC), SMU (SMU), Muskingum (MKC), and Northeastern (NEU); the parochial, regional, less well known and city schools.[2] The greatest discrimination is provided by Function 1 which separate Northeastern from the Brandeis-Dartmouth-Wellesley group. Evaluation of variable contributions

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[1] See Chapter 5 for aid in interpreting discriminant functions.

[2] The abbreviations in parenthesis are used as titles in related tables and figures.

indicates that Northeastern students place less emphasis on the Student and Faculty characteristics factor (composed of items such as type of student attending, faculty, breadth of program, and campus environment and facilities) and the Size of School and Social Climate factor composed of items describing generally strong selling points for the private schools, the size of school, social opportunities and prestige of school, while attaching greater importance to the advantages of a large metropolitan university -- location, and earnings and advancement opportunities on the job after graduation. Boston College and S.M.U. join with Northeastern in greater concern for opportunities for earnings and advancement. Wellesley, much to the disappointment of the feminine liberationists, scores the lowest on the earnings and advancement factor.

The expectations of students from each school as structured by discriminant functions 1 and 2 are illustrated in the Figure 6.1 Centour diagram, page 6-16. The Centour of Group Centroids Matrix (Table 6.2 page 6-17) describes the overall statistical distance between groups.

Function 2 highlights a few differences between Boston College, Muskingum, Northeastern and S.M.U. In particular, Muskingum students tend to place much stronger emphasis upon the "Classroom Activities" factor than do students at the other schools. Students at Boston College, SMU and Muskingum share a high degree of concern for the job related factor "Time for Personal Life".

Figure 6.2 page 6-18 illustrates the further discrimination of Northeastern from the other undergraduate schools based on Function 3 which incorporates emphasis placed on interpersonal relations in addition to size of school-social climate and location. Brandeis (BRD), Dartmouth (DRU), and Wellesley (WEL) have marginally lower expectations regarding the impact of their education on interpersonal relation skills.

Student Perceptions

The 90 semantic differential adjective responses indicating student

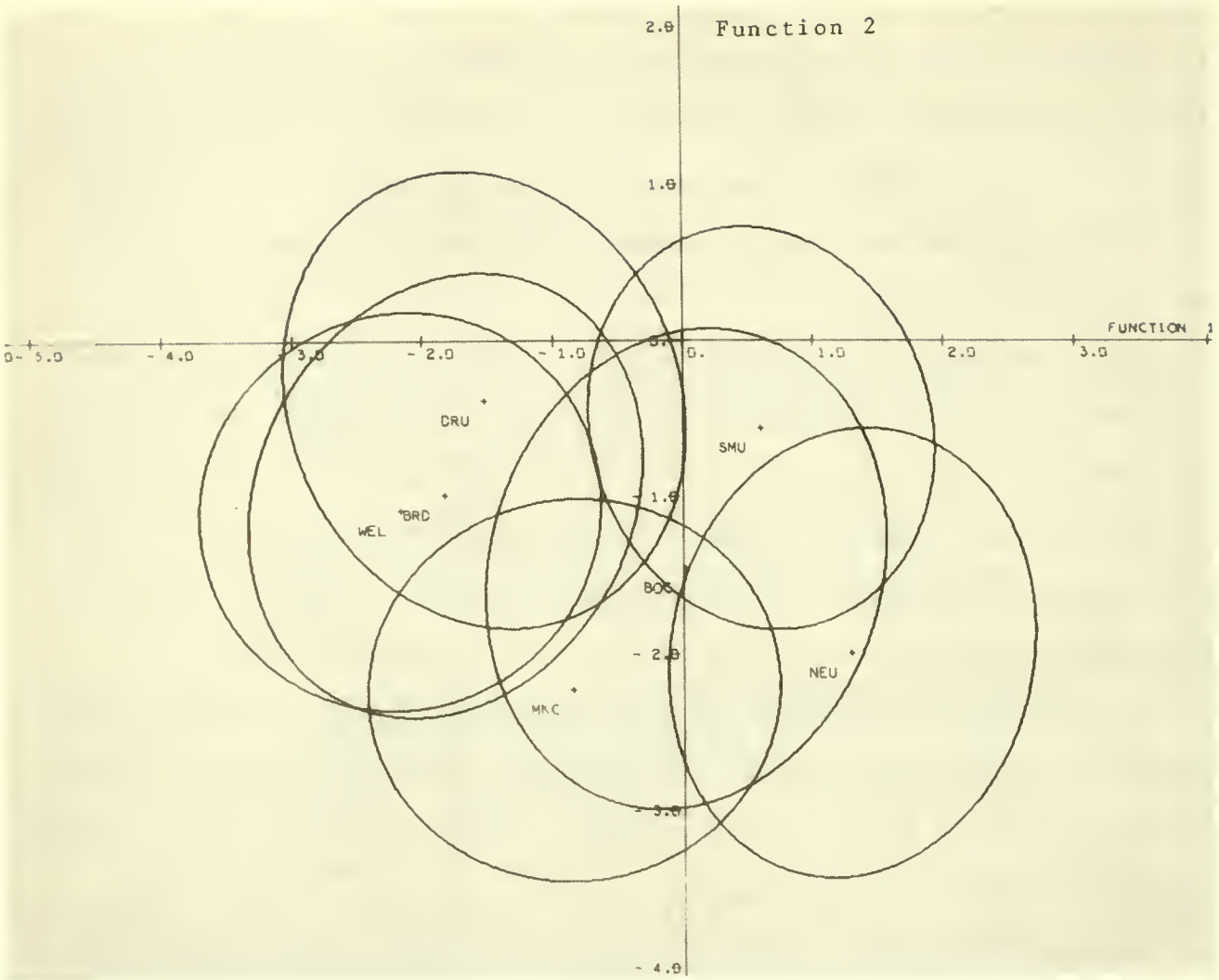

Figure 6.1 32 Centour Diagram for Seven Undergraduate Schools Based on Expectation Data Discriminant Functions 1 and 2.

Table 6.2 Centours of Group Centroids Matrix for Seven Undergraduate Schools Based on Expectation Data

		CENTROID GRP. 1 BOC	CENTROID GRP. 2 BRD	CENTROID GRP. 3 DRU	CENTROID GRP. 4 MKC	CENTROID GRP. 5 NEU	CENTROID GRP. 6 SMU	CENTROID GRP. 7 WEL
GROUP NUMBER 1	BOC	100.0000	39.6010	49.7654	59.7458	46.2888	61.0232	32.2750
GROUP NUMBER 2	BRD	43.3927	100.0000	75.8434	30.9243	5.6297	9.1602	89.2648
GROUP NUMBER 3	DRU	39.2294	80.9533	100.0000	21.0523	4.3197	21.0626	46.5889
GROUP NUMBER 4	MKC	61.0247	36.4552	34.8366	100.0000	19.1296	20.1273	32.6631
GROUP NUMBER 5	NEU	31.3557	5.0269	5.5566	10.1667	100.0000	20.6312	3.4055
GROUP NUMBER 6	SMU	74.4585	24.8215	35.6257	25.2674	26.7797	100.0000	16.5768
GROUP NUMBER 7	WEL	31.1837	92.6824	51.3192	27.9758	3.0214	4.2508	100.0000

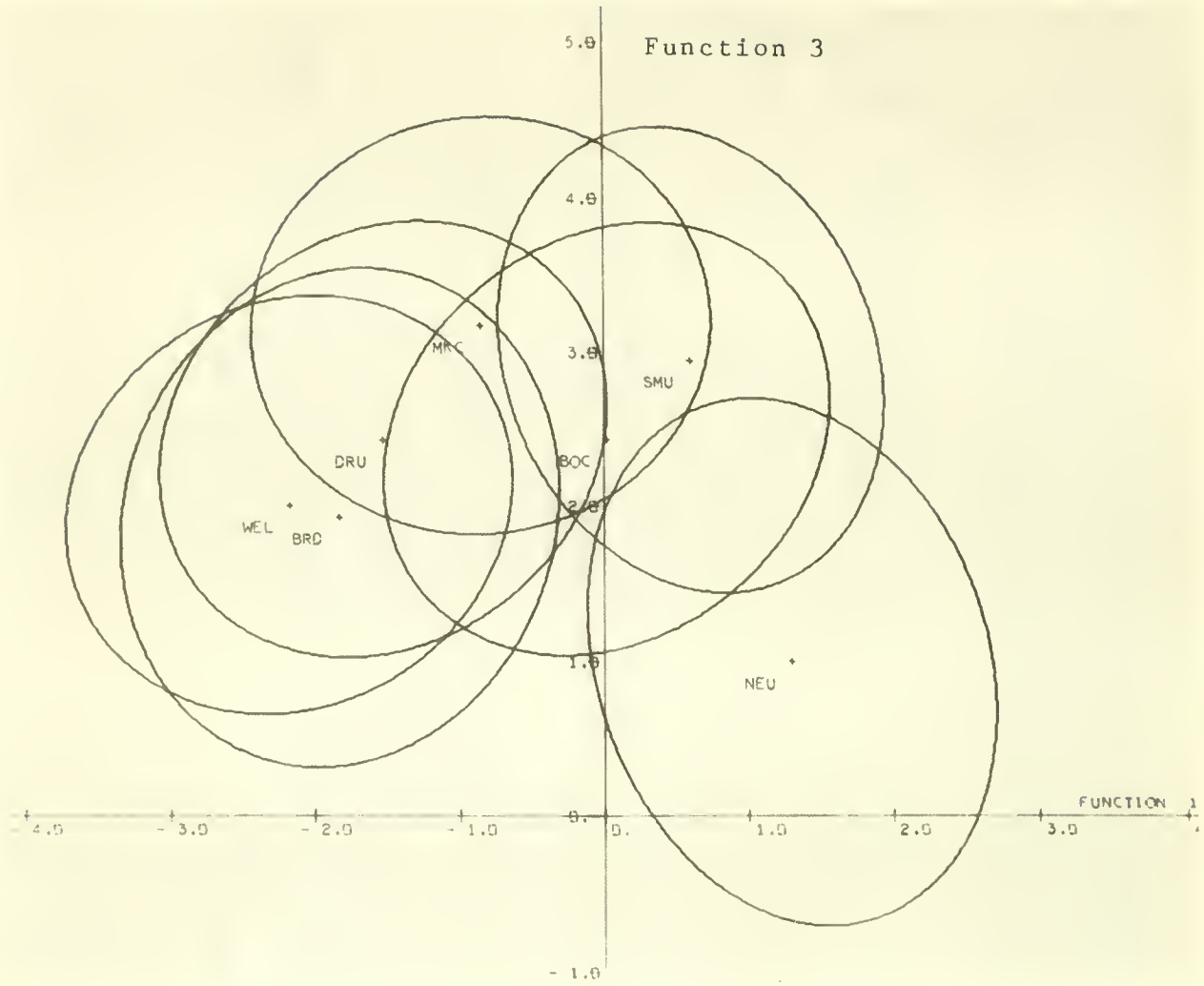

Figure 6.2 32 Centour Diagram for Seven Undergraduate Schools Based on Expectation Data Discriminant Functions 1 and 3.

perceptions of self, ideal self, and typical manager were factor analyzed to produce the eleven composite perception factors discussed in Chapter 5.[1]

(1) Persuasive Mature Leadership - Ideal Self
(2) Cold Confident Leadership - Typical Manager
(3) Personal Attributes of the Real Self
(4) Cynicism in the Real and Ideal Self
(5) Sensitivity and Sincerity of the Typical Manager
(6) Emotional and Personal Aspects of the Real Self
(7) Daring/Uninhibited Real Self
(8) Satisfaction of Ideal Self and Typical Manager
(9) Realism of Ideal and Real Self
(10) Competitiveness of Real and Ideal Self
(11) Pride of Real and Ideal Self

When factor scored responses from the seven population groups were evaluated using the discriminant analysis procedure the resulting Centour diagram (Figure 6.3, page 6-20) revealed substantial overlap between population groups.

Function 1 which tends to separate Muskingum (MKC) and SMU students from those attending other institutions, particularly Brandeis (BRD), is based largely on factors 9 (Idealism of Real and Ideal Self) and 5 (Sincerity and Sensitivity of a Typical Manager). Muskingum and SMU students are positioned at the realism end of the idealist-realist dimension of factor 9 while Brandeis students see themselves as, ideally and actually, more idealistic. This assessment is supported by positioning on factor 5. Brandeis students have a less positive view of the typical manager, describing him as much more insensitive, insincere, impatient, impersonal and cynical than do Muskingum and SMU students. The latter see the typical manager as more sensitive, sincere and personal. SMU students describe themselves as more personal and emotional than the other students. Brandeis, Dartmouth and Wellesly feel slightly more non-competitive than other students.

Muskingum (MKC) and SMU are also responsible for the major differences emphasized by Function 2. But, in this case they are at the opposite ends of

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[1] See Chapter 5, pages 5-60 through 5-66.

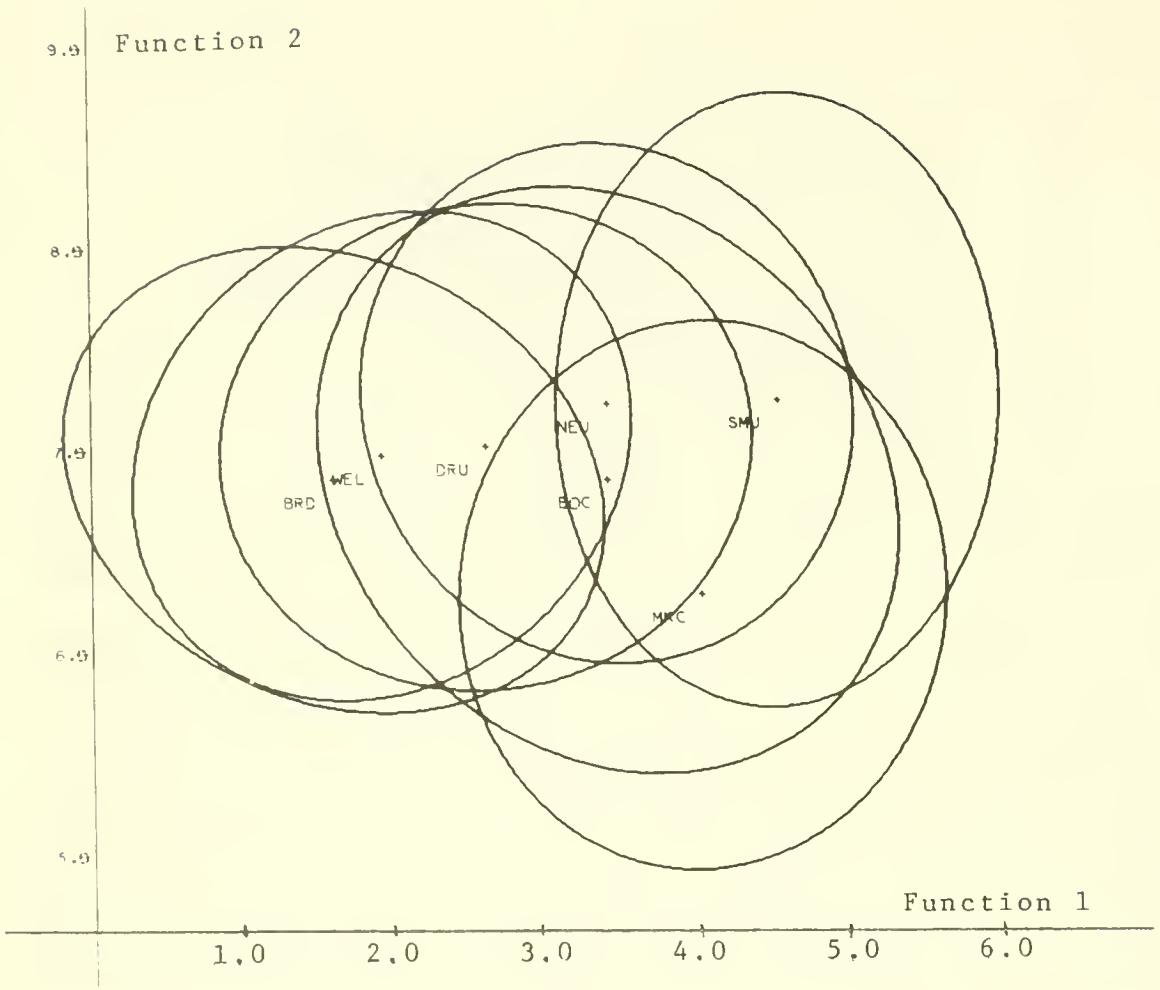


Figure 6.3 32 Centour Diagram for Seven Undergraduate Schools Based on Semantic Differential Perception Data Discriminant Functions 1 and 2

the scale. Muskingum students are less positive about their ideal self image, scoring lower on the poised, sincere and enthusiastic scale of the Persuasive-Mature Leadership - Ideal Self factor . Students at Muskingum score considerably lower on the Uninhibited/Daring factor (i.e., they describe themselves as less daring). SMU students place greater emphasis upon personal pride, scoring higher than other students on the Humble/Proud factor.

The relative homogeneity of expectations held by the seven population groups is verified by the Centours of Group Centroid Matrix displayed in Table 6.3 page 6-22. Data summarized in this table suggest that

- Boston College undergraduate perceptions are most similar to those of Muskingum and Northeastern but not that different from those of other students.
- Brandeis undergraduates share many perceptions of Wellesley students and have significantly different views than SMU students
- Dartmouth undergraduates exhibit perceptions most like those of Brandeis, Boston College and Wellesley; least like those of Muskingum and SMU.
- Muskingum shows the greatest overlap with Boston College and the smallest with Brandeis.
- Northeastern student perceptions are most like those of Boston College and most different from those of Brandeis undergraduates.
- Southern Methodist semantic differential responses are closest to those of Muskingum and furthest from those of Brandeis.
- Wellesley students share many perceptions with Brandeis and Dartmouth students; few with SMU and Muskingum undergraduates.

Personal Opinions

Personal opinion data from the seven undergraduate schools were factor analyzed to establish the twelve personal opinion factors discussed in Chapter 5.[1]

[1] See Chapter 5 for the variable composition of factors.

Table 6.3 Centours of Group Centroids Matrix for Seven Undergraduate Schools Based on Semantic Differential Perception Data

		CENTROID GRP. 1 BOC	CENTROID GRP. 2 BRD	CENTROID GRP. 3 DRU	CENTROID GRP. 4 NEU	CENTROID GRP. 5 MKC	CENTROID GRP. 6 SMU	CENTROID GRP. 7 WEL
GROUP NUMBER 1	BOC	100.0000	54.4609	81.6714	84.4276	89.0859	69.5649	63.9170
GROUP NUMBER 2	BRD	55.7977	100.0000	81.7749	26.7488	38.4048	12.8796	93.4883
GROUP NUMBER 3	DRU	81.4362	78.3495	100.0000	54.9460	73.3289	40.8972	80.0432
GROUP NUMBER 4	MKC	89.0477	37.4924	55.7999	100.0000	60.4293	77.2237	29.7030
GROUP NUMBER 5	NEU	92.3494	41.2187	79.4062	68.4217	100.0000	64.6982	61.1525
GROUP NUMBER 6	SMU	76.1712	20.6436	49.6138	73.8476	65.9493	100.0000	26.3328
GROUP NUMBER 7	WEL	68.8366	94.0506	80.7453	33.8820	49.5993	18.5550	100.0000

(1) Cynicism about Business in General
(2) Unionism and Protectionism
(3) Corporate social Responsibilities
(4) Small vs. Large Corporations
(5) Authoritarian Structure
(6) Committee vs. Individual Management
(7) Separation of Private and Corporate Life
(8) Theory X vs. Theory Y Management
(9) Cynicism Regarding Management Ethics
(10) Capabilities of the "Average Worker"
(11) Cynicism Regarding Personal Advancement
(12) The Role of the Specialist in Industry

Discriminant analysis of factor scored responses from the seven schools produced four significant functions. However, the first function, which explained 67% of the variation, was the most powerful discriminator. Functions two through four explained 20%, 5% and 5% of the variation respectively. The results of this analysis are summarized in a Centour Diagram (Figure 6.4 page 6-24) and a Centours of Group Centoids Matrix (Table 6.4 page 6-25). Both displays emphasize the differences between SMU and Muskingum (MKC) students and those attending the Eastern colleges.

The discrimination based on function 1 is attributable to differences in attitudes toward business. However, a somewhat confusing picture emerges. Muskingum and SMU students are significantly more pro union (Unionism and Protectionism factor) and somewhat more anti committee (Committee vs. Individual Management factor) than their eastern colleagues. They also share the belief that manager-subbordinate relationships should be more Theory Y (man is basically good) than Theory X (man is basically evil), factor 9. However, Southern Methodist students express the greatest cynicism toward business as a profession (Cynicism About Business in General factor) and note relatively strong agreement with opinions such as "Many employers think only of their profits and care little for employee welfare".

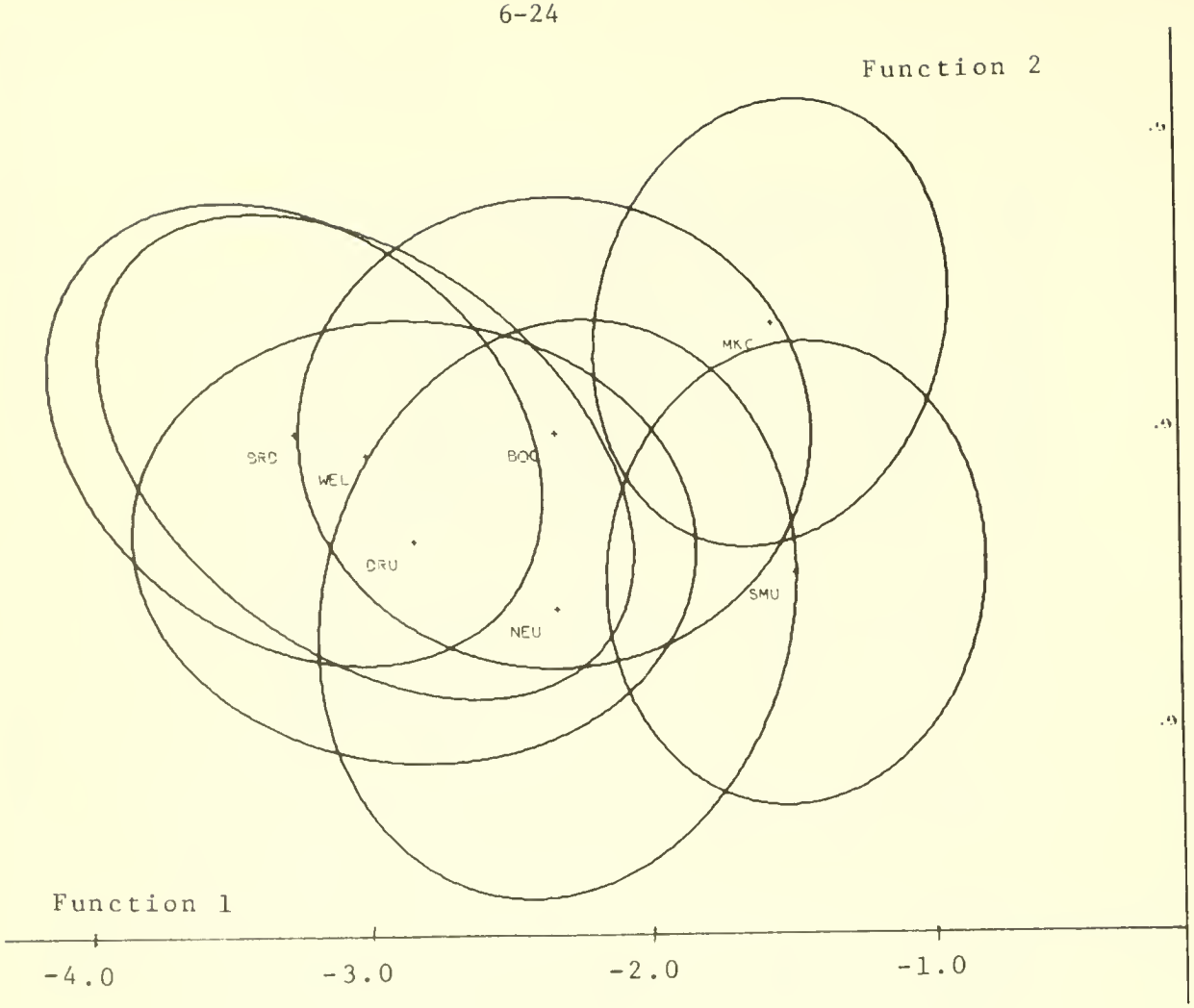


Figure 6.4 32 Centour Diagram for Seven Undergraduate Schools Based on Personal Opinion Data Discriminant Functions 1 and 2

Table 6.4 Centours of Group Centroids Matrix for Seven Undergraduate Schools Based on Personal Opinion Data

		CENTROID GRP. 1 BOC	CENTROID GRP. 2 BRD	CENTROID GRP. 3 DRU	CENTROID GRP. 4 MKC	CENTROID GRP. 5 NEU	CENTROID GRP. 6 SMU	CENTROID GRP. 7 WEL
GROUP NUMBER 1	BOC	100.0000	38.5039	56.4391	36.4798	71.3796	31.0198	52.3650
GROUP NUMBER 2	BRD	31.5949	100.0000	69.1795	2.2400	31.4571	1.3288	46.5237
GROUP NUMBER 3	DRU	58.8401	78.7388	100.0000	10.1148	70.5615	12.1853	81.2760
GROUP NUMBER 4	MKC	54.8042	6.0295	25.5113	100.0000	40.6631	53.7480	11.2619
GROUP NUMBER 5	NEU	62.3558	49.8875	71.9390	23.4290	100.0000	38.8678	35.4766
GROUP NUMBER 6	SMU	45.5984	10.6336	39.7617	51.0591	48.7936	100.0000	22.4547
GROUP NUMBER 7	WEL	58.2471	65.3614	84.6432	6.1286	43.6230	5.9836	100.0000

Muskingum (MKC) is marginally separated from the other schools by function 2. The discrimination is based upon the higher emphasis of Muskingum students on the Corporate Social Responsibility factor 3.

The data on the Centour of Group Centroids Matrix (Table 6.4) may be restructured to reflect the most striking similarities and differences in the opinion profiles of students at each of the seven schools. The result of this analysis is presented in Table 6.5.

Table 6.5 Similarities and Differences in Managerial Opinions for Students at Seven Undergraduate Schools

Institution	Most Similar to	Most Different from
Muskingum (MKC)	SMU, BOC	DRU, WEL
Southern Methodist (SMU)	MKC, NEU	BRD, WEL
Boston College (BOC)	NEU. DRU	BRD, SMU
Brandeis (BRD)	DRU, WEL	MKC, SMU
Dartmouth (DRU)	WEL, NEU	MKC, SMU
Northeastern (NEU)	BOC, DRU	BRD, MKC
Wellesley (WEL)	DRU, BOC	MKC, SMU

We will now return to data from the seven undergraduate schools broken down in three ways: by class (upper and underclassmen), by sex, and by interest in particular fields of graduate study. Our objective will be to locate major differences <u>within</u> undergraduate schools, and

determine if comparable differences are found within similar student groups at other schools. This analysis will enable us to investigate the possibility that underclassmen (or women, or history majors, etc.) may show more affinity for other underclassmen in other schools than do for the upperclassmen (or women, or history majors, etc.) within their own setting.

This analysis will follow the convention established in prior analyses - the four types of Pre-Term questionnaire data (demographics, expectations, perceptions and opinions) will be examined separately.

Upper vs. Underclass Comparisons

Since our samples include students at all levels in the undergraduate population it is natural to wonder about the differences between students in different years. Specifically, we might ask "How do the underclassmen differ from their more experienced upperclassmen?" "Can these differences be attributed to changes in admission criteria - or do they reflect the differences in time spent in the educational activity?"

Discrete Category - Demographic Data

The demographic data obtained through the Pre-Term questionnaires provide a mechanism for detecting shifts in admissions policy or changes in the backgrounds of students admitted to the seven universities between 1965 and 1969. (Since the Muskingum sample was limited to Freshmen no upperclass-underclass comparison could be made at that school.)

Chi square analysis was applied within each school to establish significant differences between upper and underclassmen. An overall X^2 was used to identify

differences among upper and underclass students at a particular school and upper and lower class members at all other schools. Detailed X^2 analyses provided the basis for closer examination of specific differences between upper and underclassmen at each school. Table 6.9 page 6-29 to 6-32 summarizes responses and X^2 computations for items found to be significant at the .01 and .05 level within schools. The following differences are noted at the indicated levels of significance.

> Boston College underclassmen expect to earn more in salary on their first job than do the upperclassmen. (.05)
>
> Brandeis underclassmen have fewer brothers and sisters (.05). Brandeis upperclass students give more negative responses when asked if they expect to pursue a Ph.D. (.05).
>
> A significantly greater portion of Dartmouth undergraduates are undecided about pursuing a Ph.D. (.05)
>
> SMU upperclassmen have more older brothers and sisters (.01). SMU undergraduates are proportionately higher in the "very religious" category of religious practice. (.01).
>
> Wellesley underclass girls have more self-employed mothers (.05) while a greater proportion of upperclass mothers fall in the small company employer category (.05). The Wellesley upperclass has more history majors while the underclass students are more interested in foreign language and English (.05). Wellesley upperclassmen are more inclined to seek a Ph.D. (.01) - underclassmen are more undecided.
>
> Northeastern upperclassmen are demographicaly indistinguishable from their underclass associates.
>
> More Wellesley Freshmen and Sophmores described themselves as "somewhat religious" in contrast to the Junior and Seniors who reported being "not at all religious".

The number of differences uncovered is not great. Only three items are significant at the .01 level and these are hardly startling. Three schools have significant differences between upper and underclassmen concerning the decision to pursue a Ph.D. Two schools show greater underclass orientation toward religious practice and SMU upperclassmen have more older brothers and sisters than do underclassmen. All in all the classes of '70 and '71 are demographically indistinguishable from those of '72 and '73.

Table 6.9

Significant Differences Between Underclassmen and Upperclassmen at the Same Institution

School	Question	Underclassmen	Upperclassmen	X^2	Degrees of Freedom	Significance Level
Boston College	26. Indicate the yearly salary range you expect to earn on your first job					
	1. Below $5,000	2.000	3.000			
	2. $5,000-$10,000	26.000	41.000			
	3. $10,000-$15,000	45.000	23.000			
	4. $15,000-$20,000	6.000	3.000			
	5. $20,000-$30,000	2.000	0.0			
	6. Above $30,000	1.000	0.0	$X^2 = 13.815$	5	.05
Brandeis	9. How many younger brothers and sisters do you have? Total					
	1	29	18			
	2	6	14			
	3	3	8			
	4	0	1			
	5	0	0			
	6	0	0			
	7	0	0			
	8	0	0			
	9	0	0	$X^2 = 8.946$	3	.05

Table 6.9 (Continued)

School	Question	Underclassmen	Upperclassmen	X^2	Degrees of Freedom	Significance Level
	19. Do you plan to pursue graduate study at the Ph.D. level?					
	1. Yes	20	13			
	2. No	10	20			
	3. Undecided	32	22	$X^2 = 6.274$	2	.05
Dartmouth	19. Do you plan to pursue graduate study at the Ph.D. level?					
	1. Yes	47	30			
	2. No	26	21			
3.	3. Undecided	80	28	$X^2 = 3.176$	2	.05
No Significant differences were recorded for Northeastern Under and Upplerclassmen						
SMU	8. How many older brothers and sisters do you have (total)					
	1	18	163			
	2	5	67			
	3	0	11			
	4	0	1			
	5	1	0			
	6	0	0			
	7	0	0			
	8	0	0			
	9	0	0	$X^2 = 11.840$	4	.01

Table 6.9 (Continued)

School	Question	Underclassmen	Upperclassmen	X^2	Degrees of Freedom	Significance Level
	1. Would you describe your religious practice as:					
	1. Not at all religious	3	75			
	2. Somewhat religious	32	358			
	3. Very religious	9	34			
				$X^2 = 10.625$	2	.01
Wellesley	5. Is your mother employed by:					
	1. Government	2	4			
	2. Large Company	3	0			
	3. Self	9	0			
	4. Small Company	3	7			
	5. School or University	23	11			
	6. Non-profit agency	4	6			
	7. Other	7	3			
				$X^2 = 16.612$	6	.05
	9. Would you describe your religious practice as:					
	1. Not at all religious	44	39			
	2. Somewhat religious	84	36			
	3. Very religious	18	9			
				$X^2 = 6.242$	2	.05

Table 6.9 (Continued)

School	Question	Underclassmen	Upperclassmen	X^2	Degrees of Freedom	Significance Level
Wellesley	17b. Select the item which best describes your major field of study					
	1. History	4	13			
	2. Political Science	7	10			
	3. Philosophy	2	5			
	4. Art	9	9			
	5. Music	2	0			
	6. Foreign Language	11	4			
	7. English	13	6			
	8. Education	2	3			
	9. Physical Education	0	0	$X^2 = 14.625$	7	.05
	19. Do you plan to pursue graduate study at the Ph.D. level?					
	1. Yes	12	18			
	2. No	42	29			
	3. Undecided	93	37	$X^2 = 11.367$	2	.01

Between School Comparison of Under and Upperclassmen

How do underclass and upperclass student demographics differ when examined across schools? In this section we will deal with underclassmen and upperclassmen separately, comparing each set (such as underclassmen at Brandeis) to their counterparts in other institutions (underclassmen at other schools, Boston College, Northeastern, etc.). Although we may expect to encounter many of the differences already described in the overall analysis, the objective is to isolate similarities and differences among underclass and upperclass peer sets across schools. We will begin by looking at the underclass sets.

Underclass Demographics. Demographic data for underclassmen at Boston College, Brandeis, Dartmouth, SMU and Wellesley were subjected to X^2 analysis. Of a total of twenty-three items, eighteen showed significant differences between underclassmen at the different schools at the .01 level, and three at the .05 level, leaving only two items of common agreement between underclass students.

Two items showed no significant differences between sets: "Have you served in the armed forces?" and "How many older brothers and sisters do you have?" Only 10 students in the undergraduate samples have served in the armed forces, and the distribution of older brothers and sisters was normal for all schools. Evidently service in the armed forces was a significant discriminator in the overall comparison because of the upper class contribution.

Only one item that did not show up in the overall between school analysis produced a significant difference between underclass sets. All other significant items showed differences which were congruent with the overall analysis. When asked to describe their mother's employment significantly more SMU and Wellesley students reported "Self" while Northeastern and Boston College students answered "Large Company".

Upperclass Demographics. X^2 analysis of upperclass demographic data

accentuates the point already made for the underclass populations. There are as many or more differences than similarities between upperclass groups and more significant differences among upperclass groups than among schools. Nineteen items were significantly different at the .01 level, one item at the .05 level. Only three items showed no significant difference.

Two items which did not show up in the overall school comparisons produced significant differences between upperclass groups. When asked if their mothers had worked for wages at any time since they were born, significantly more students at Northeastern (63%) answered affirmatively, while 71% of Dartmouth students gave negative responses.

Significance tests of family composition data are seriously affected by two students at Dartmouth and one at Boston College who reported seven younger brothers and sisters.

Upper and Underclass Expectation Data

Do underclass educational and career expectations differ from those of upperclassmen? To answer this question data from twelve groups (six underclass groups and six upperclass groups) were analyzed using discriminant analysis techniques.

We will begin our examination of between group differences with the Centour Diagrams for the discriminant functions based on the three questions sets:

Question 15. "Please indicate ... your expectations as to how much the following activities will contribute to your career objectives..."

Question 16. "... indicate the amount of change in yourself that you would like to take place this year as a result of your present studies..."

Question 29. "People differ in what is important to them in a job. In this section we have listed a number of factors which people might want in their work. Please rate ... how important each of these factors is to you."

Our objective in looking at these plots is to determine the degree of overlap or separation between upper and underclass students at each school. If little overlap occurs between upper and underclassmen at a particular school, we will want to scrutinize the detailed data for these groups. However, if upperclass and underclass groups are indistinguishable we can limit our analysis to between school differences. The school and class abbreviations used in the following analyses are:

BOC = Boston College
BRD = Brandeis University
DRU = Dartmouth University
NEU = Northeastern University
SMU = Southern Methodist University
WEL = Wellesley College

UND = Underclassmen
UP = Upperclassmen

Figure 6.5 page 6-36 contains the Centour diagram for Functions 1 and 2 resulting from the twelve group discriminant analysis of Question 15. Brandeis upper and underclassmen are the only groups that exhibit significant differences. All other under and upperclass sets show large overlap along school lines. Examination of the variable contributions for Brandeis under and upperclassmen shows that underclassmen place greater emphasis upon reading, outside lectures, class discussions and seminars than do their upperclassmen.

The Centour Diagram of Functions 1 and 2 from the discriminant analysis of Question 16 is illustrated in Figure 6.6 page 6-37. The strange hieroglyphics in the center of the plot are the overlapping titles for Boston College upper and underclassmen. Brandeis and Wellesley underclass students appear to exhibit greater overlap with each other than with their respective upperclassmen. However data from the Centours of Group Centroids Matrix cause us to play down this condition. The Brandeis under and upperclass groups overlap 91.6 and 90.2

Figure 6.5 32 Centour Diagram for Upper and Underclass School Sets Based on Question 15 Discriminant Functions 1 and 2

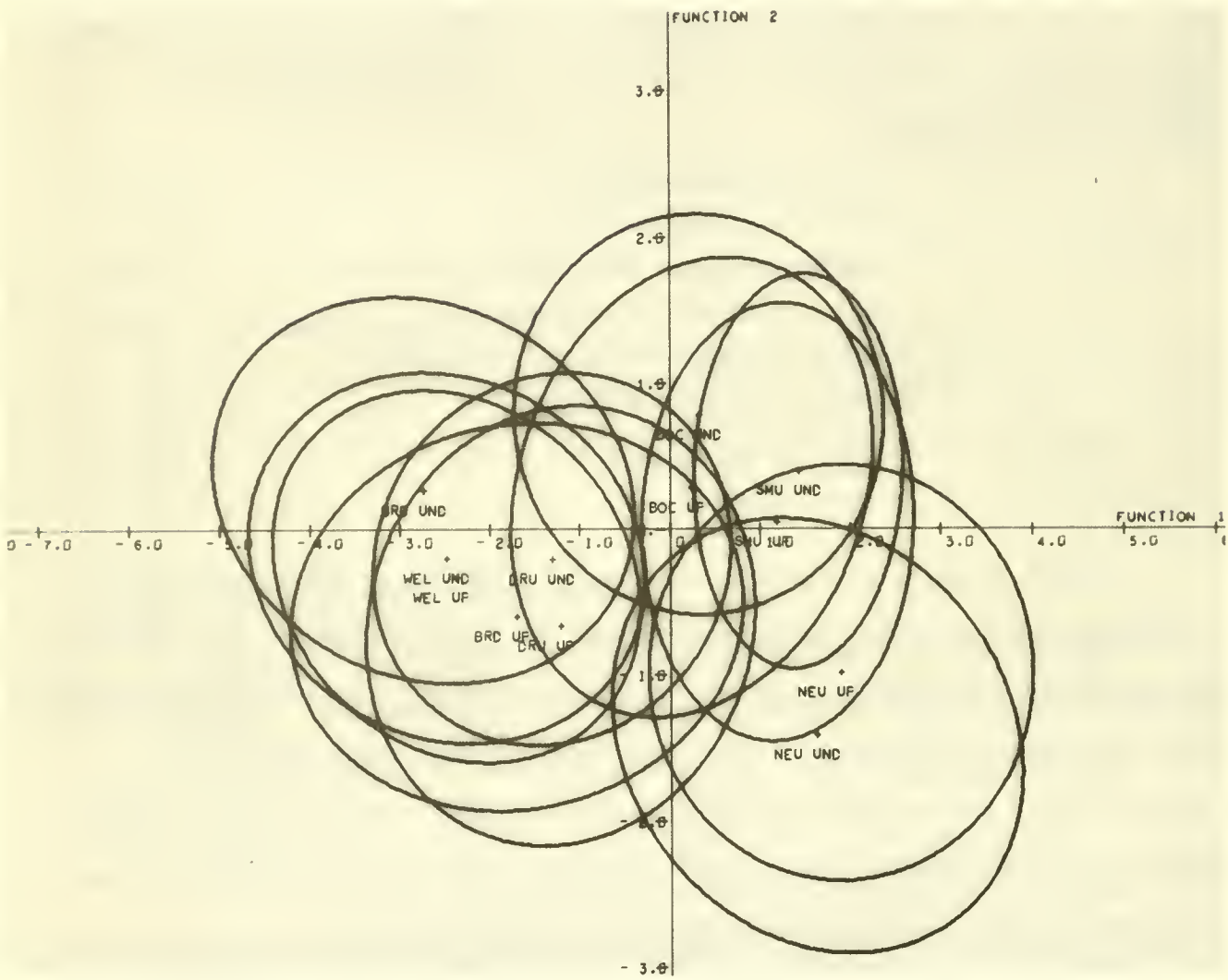
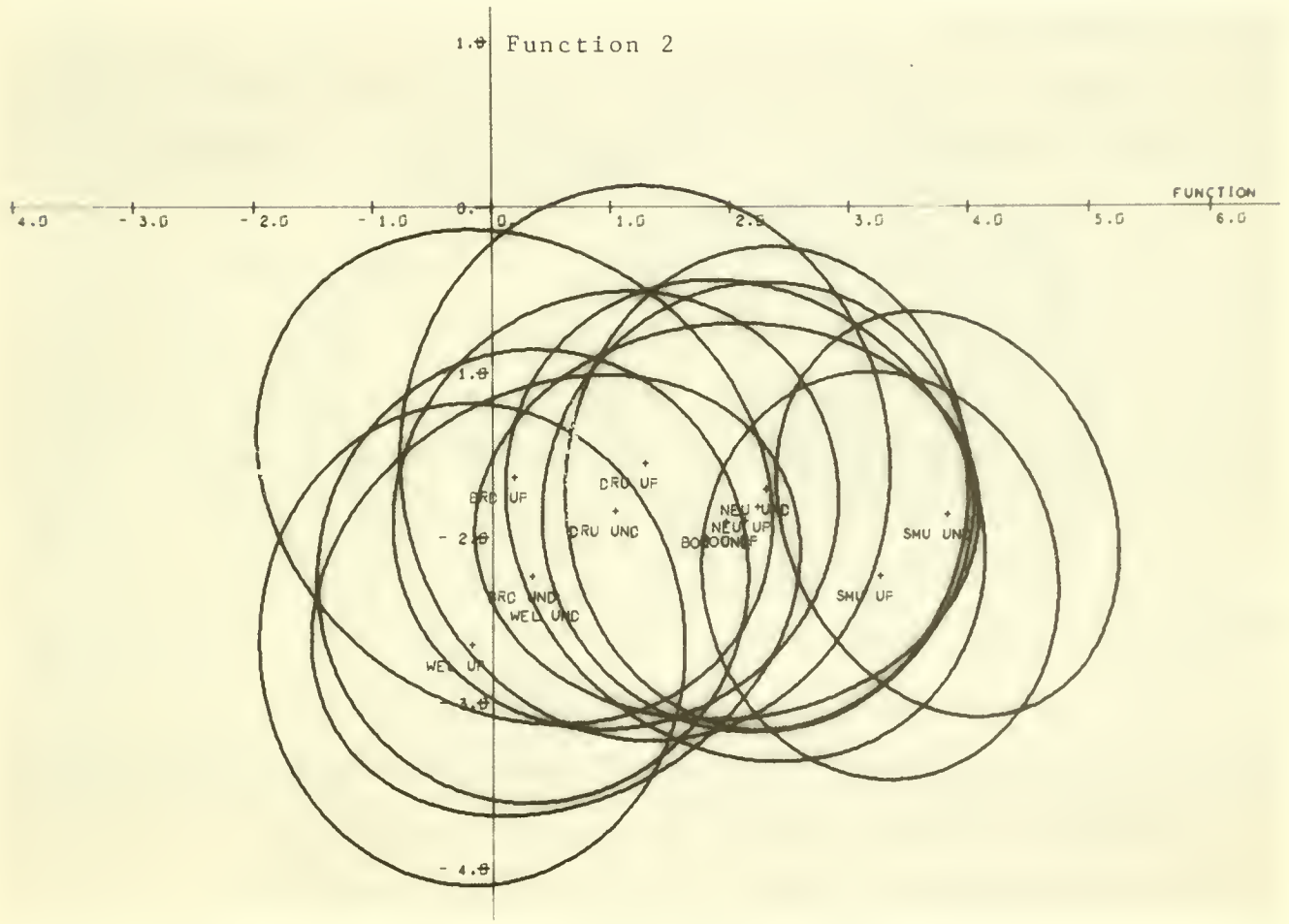


Figure 6.6 32 Centour Diagram for Upper and Underclass School Sets Based on Question 16 Discriminant Functions 1 and 2



as do Brandeis and Wellesley underclassmen (94.1 and 93.2). The overlap between Wellesley under and upperclass groups is also extremely high (90.2 and 93.2) indicating a close linkage between all groups on the left hand side of the Figure 6.6 plot. The most significant discrimination produced by Function 1 involves between school (SMU vs. Brandeis and Wellesley) rather than within school class differences.

Figure 6.7, page 6-39, derived from the discriminant analysis of Question 29 tells a similar story. No significant function separates the underclass and upperclass groups at any school.

Figure 6.8 page 6-40 contains the Centour diagram produced by the discriminant analysis of under and upperclass perception of self, ideal self and a typical manager. As indicated by this plot based on Functions 1 and 2 of the perception discriminant analysis the amount of overlap among groups is enormous. The lowest overlap between underclassmen and upperclassmen at the same school is 93.1, 92.9 for SMU underclass and upperclassmen.

The Centour Diagram generated by Functions 1 and 2 of the discriminant analysis of data from the Personal Opinion Questionnaire is presented in Figure 6.9 page 6-41. On first examination the overlap among under and upperclass groups from the same schools appears to be less than that found in the expectation and perception plots.

Figure 6.7 32 Centour Diagram for Upper and Underclass School Sets Based on Question 29 Discriminant Functions 1 and 2

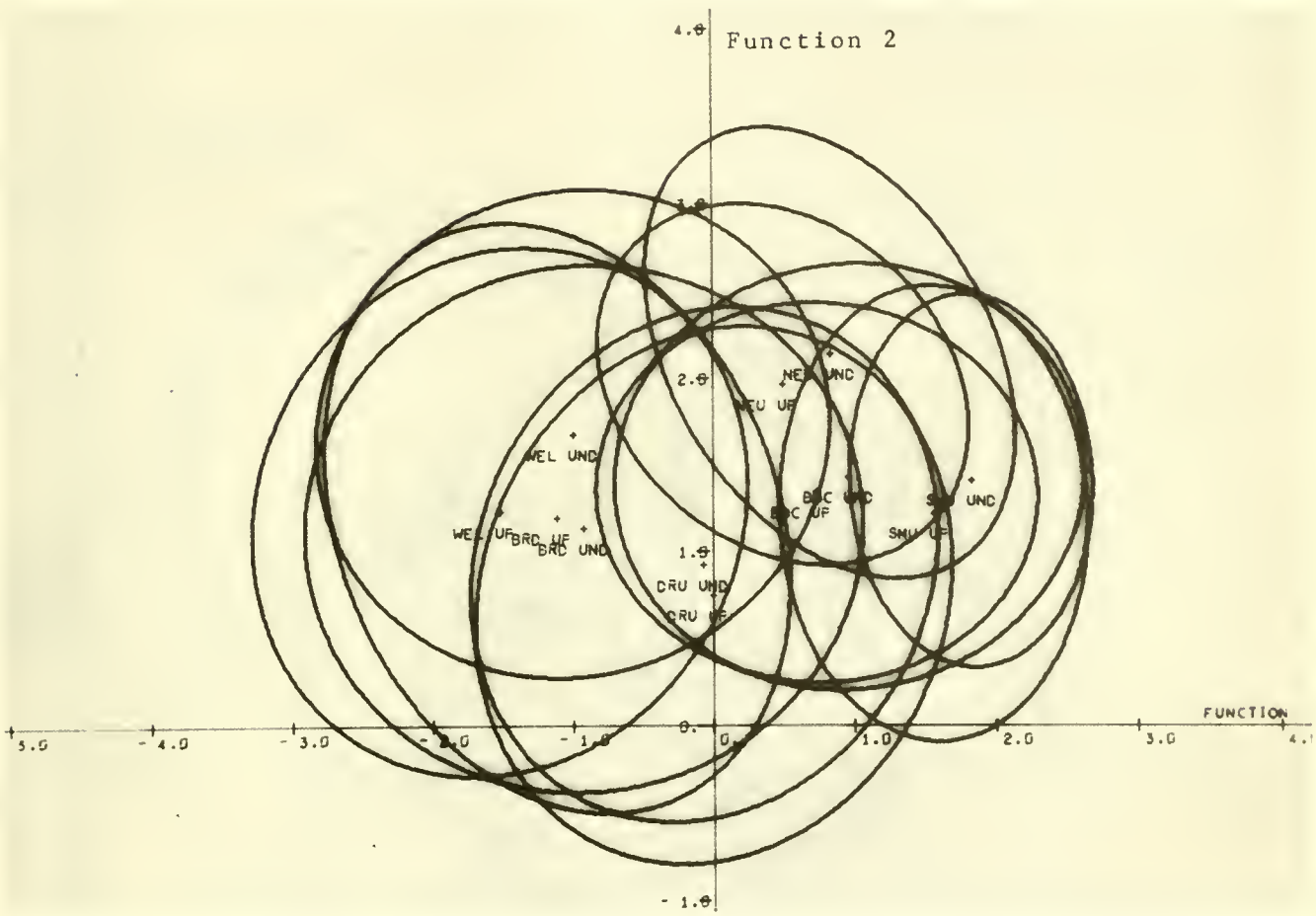


Figure 6.8 32 Centour Diagram for Upper and Underclass Sets Based on Semantic Differential Perception Discriminant Functions 1 and 2

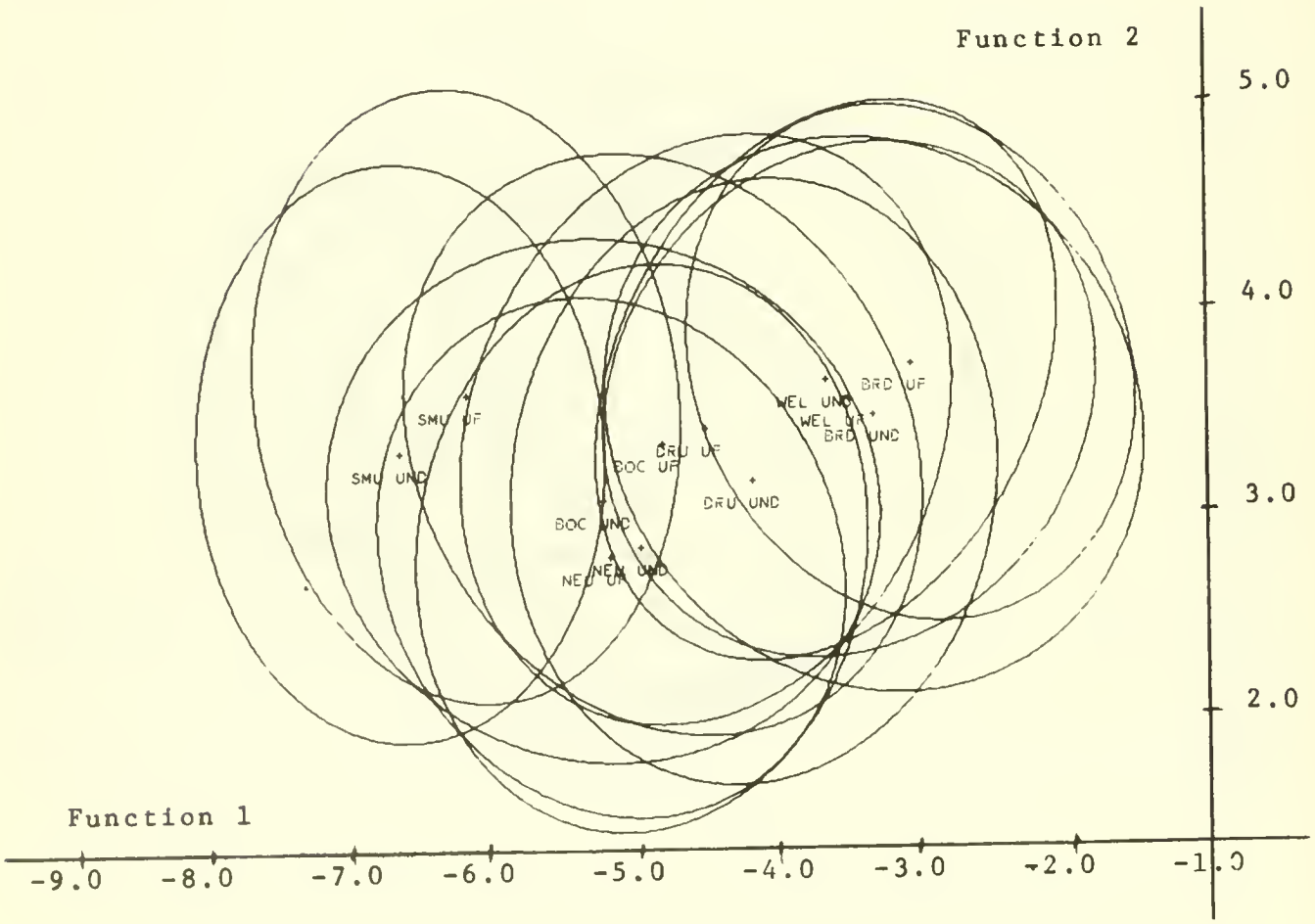
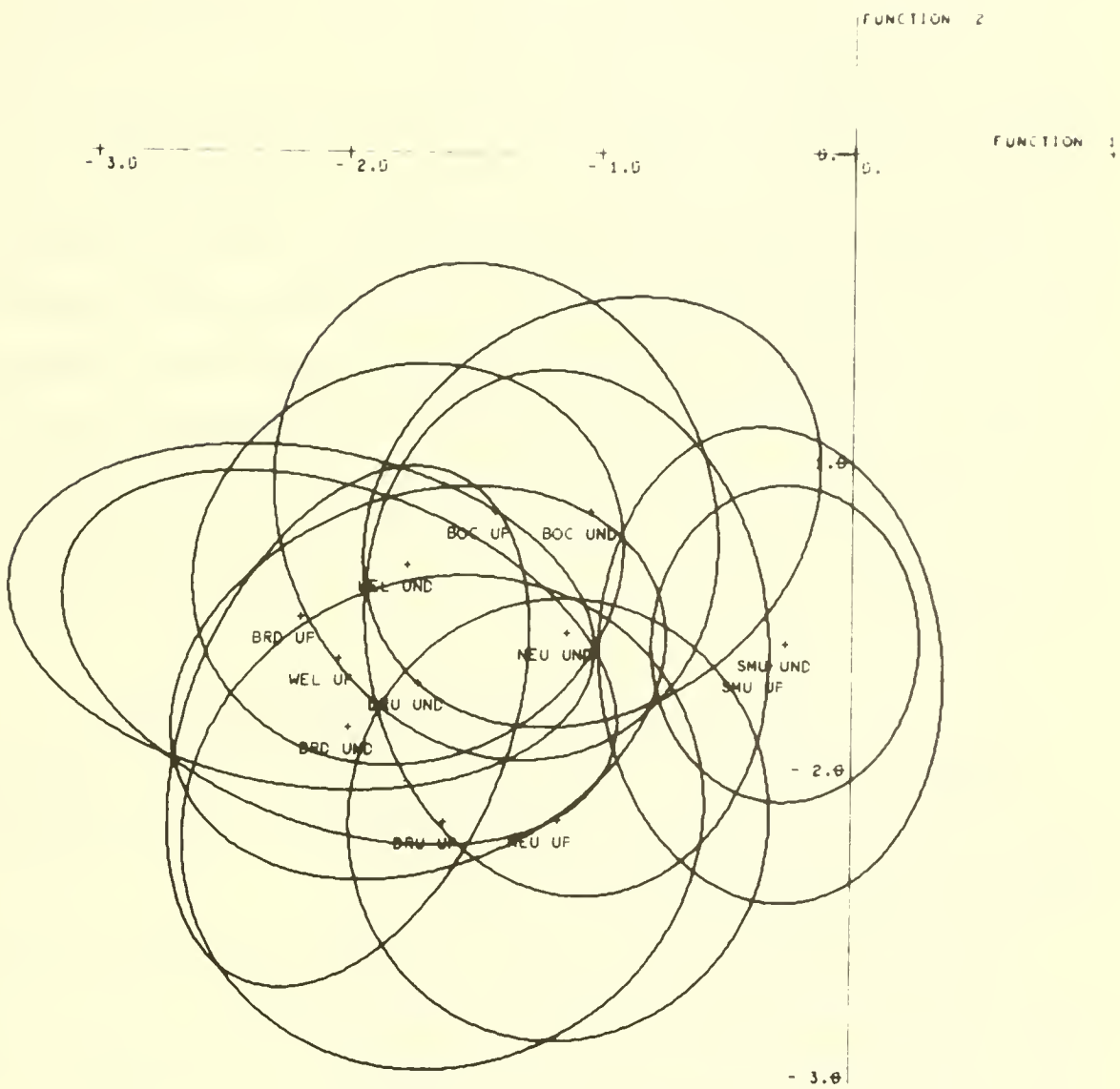


Figure 6.9 32 Centour Diagram for Upper and Underclass Sets Based on Personal Opinion Discriminant Functions 1 and 2



Although the Northeastern class sets seem to be effectively separated by Function 2, the actual overlap in their dispersions (67.7 and 72.8) determined from the Centours of Group Centroids matrix counters the visual impression obtained from the plot.

The Centours matrix reveals that Brandeis upper and underclassmen actually have the least overlap on the Centour diagram (25.6 and 79.1). An examination of variable contributions reveals that the differentiation stems from the Brandeis underclassmen's greater emphasis upon hierarchical and authoritarian organization structures, greater cynicism concerning business ethics and less confidence in the motivation and integrity of the average worker in industry.

On the basis of this analysis of demographic, expectation, perception and attitudinal data we may conclude that underclassmen and upperclassmen at the same institutions have more in common with each other than with members of comparable classes at other institutions. With a few, rather minimal exceptions, it is the school and not the class that accounts for the differences noted thus far.

Underclass Men vs. Underclass Women Analysis

While sex is technically a demographic, it warrants separate consideration since we would expect to find significant differences in orientation toward management among undergraduate men and women.

The sample available for this analysis is affected by the presence of Wellesley and Dartmouth with only women and men respectively in their populations and by ninety students at other schools who failed to indicate their sex on the questionnaire. The sample structure is summarized in Table 6-10.

Table 6.10

Initial Sample Structure for Men vs. Women Comparison

Institution	Men	Women
Boston College	120	27
Brandeis	53	62
Dartmouth	225	--
Muskingum	212	219
Northeastern	114	35
Southern Methodist	427	77
Wellesley	--	226
Total Sample	1,151	646

Because of the small number of male respondents at Boston College, Brandeis and Northeastern the population was restructured by combining male respondents from these schools in a single "Rest of Men" category. Women at these same schools and at Southern Methodist were similarly combined in a "Rest of Women" group. Table 6.11 summarizes this final sample structure on which all analyses in this section are based.

Table 6.11

Revised Sample Structure for Men vs. Women Comparison

Sample Group	Abbreviation	Men	Women
Dartmouth Men	DART M	225	-
Muskingum Men	MUSKY M	212	-
Muskingum Women	MUSKY W	-	219
SMU Men	SMU M	427	-
Wellesley Women	WELL W	-	226
"Rest of Men"	REST M	287	-
"Rest of Women"	REST W	-	201
Total Sample Size		1,151	646

Comparative Expectations

Expectation data from Questions 14, 15, 16 and 29 of the Undergraduate Pre-Term Questionnaire for these seven groups are examined in this section.

Discriminant analysis of Question 14,

> "Below is a list of possible strengths and weaknesses of educational institutions. Indicate your perception of whether the characteristic was a positive or negative factor in your rating of your particular school."

yielded five significant functions explaining 98.14% of the total discriminant power.

Two overlapping groups emerge from the analysis, illustrated by the Centour Diagram in Figure 6.10 page 6-45 and the Centours of Group Centroids Matrix, Table 6.12 page 6-46. These are Muskingum Men and Women; and SMU Men and Rest of Men. (Although the Rest of Women show the greatest affinity for the latter group, they also show the largest overlap with all other groups.) Wellesley Women and Dartmouth Men appear to overlap significantly in the plot of functions 1 and 2. However the Centour Matrix values (44.0, 29.4) indicate less overlap than measured between other overlapping sets.

The lowest overlaps are found between unisexual groups: Wellesley Women and Muskingum Women (18.2, 17.8), Wellesley Women and Rest of Women (35.1, 13.6), Dartmouth Men and Muskingum Men (18.4, 32.5), Dartmouth and SMU Men (19.1, 28.5), and Dartmouth and Rest of Men (12.8, 23.3).

Variable contributions responsible for differences

Figure 6.10 32 Centour Diagram for Men and Women Based on Question 14 Discriminant Functions 1 and 2

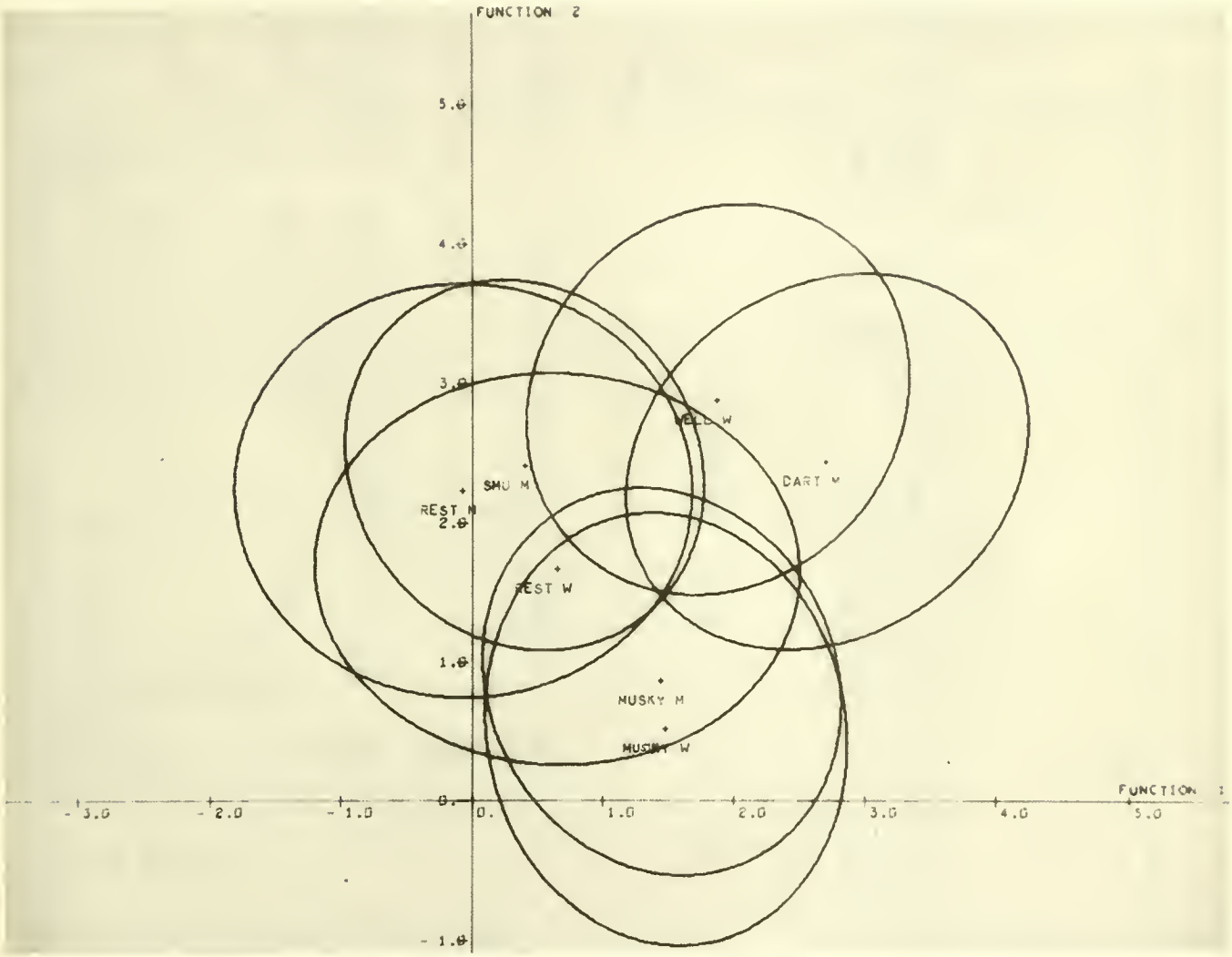


Table 6.12 Centours of Group Centroids Matrix for Men and Women Based on Question 14

	VARIABLE	CENTROID GRP. 1 WELL W	CENTROID GRP. 2 MUSKY W	CENTROID GRP. 3 REST W	CENTROID GRP. 4 DART M	CENTROID GRP. 5 MUSKY M	CENTROID GRP. 6 SMU M	CENTROID GRP. 7 REST M
GROUP NUMBER 1	WELL W	100.0000	18.2208	43.7063	44.0439	23.2474	29.9225	35.0932
GROUP NUMBER 2	MUSKY W	17.9372	100.0000	56.9381	22.2120	71.3012	23.2317	29.0955
GROUP NUMBER 3	REST W	35.2976	58.1797	100.0000	26.8449	39.3299	57.5078	62.0099
GROUP NUMBER 4	DART M	29.3603	25.6595	27.6054	100.0000	18.3934	19.1207	23.3236
GROUP NUMBER 5	MUSKY M	22.5835	68.8824	38.5487	32.5449	100.0000	35.5356	39.4736
GROUP NUMBER 6	SMU M	36.0247	33.9338	65.6966	28.5486	32.6967	100.0000	63.8838
GROUP NUMBER 7	REST M	13.5784	20.7817	68.8118	12.7556	23.8918	59.6685	100.0000

confirm the major overlaps, but do not always conform to the pattern of differences between groups. Note that we examine the variables which contribute heavily (have large weights) on the individual discriminant functions. However, all variables may contribute slightly to the major differences reported in the Centour of Group Centroids measurement. The most visibly different variable contributions for the groups will be discussed below.

Wellesley Women and Dartmouth Men place less emphasis upon specific field of interest than do the other groups. Wellesley Women differ from Muskingum Men and Women (especially the Women) by placing greater importance on location of school.

Wellesley Women, Dartmouth Men, SMU Men and Rest of Men all score higher on the prestige of school variable than Muskingum Men and Women. Wellesley Women, Dartmouth Men and Muskingum Men report lower values for opportunity for specialization than SMU Men and Rest of Men.

Wellesley Women and Dartmouth Men score higher on faculty than Rest of Men.

Dartmouth Men and Rest of Men are lower on the social opportunities variable. Muskingum Women lead the other groups in emphasis upon size of school. Muskingum Men and SMU Men score slightly lower on the breadth of program. Wellesley Women and Rest of Women are higher on qualitiative emphasis.

Discriminant analysis of Question 15,

> "Indicate your expectations as to how much the following activities will contribute to your career objectives",

produces the Centour Diagram illustrated in Figure 6.11 page 6-49 and the Centours of Group Centroids Matrix, Table 6.13 page 6-50. Although the data are different, the analysis discriminates between roughly the same group sets established by Question 14. Muskingum Men and Women stick together (72.6, 70.6) as do the Rest of Men and SMU Men (91.3,95.6). Although the Rest of Women overlap with Rest of Men (68.0, 66.4) they show less affinity for SMU Men, (27.3, 49.7). Dartmouth Men and Wellesley Women show greater overlap on this question (68.2, 68.7). The plot is shaded to emphasize the separation between SMU Men and Wellesley Women (12.3 and 4.3) and Muskingum Women (17.4, 8.2). Muskingum Men also show little overlap with Wellesley Women (22.7, 15.3).

Three significant functions explain 92.98% of the total discrimination. Variable contributions responsible for the discrimination are explained below. The largest male/female differences stem from questions which emphasize business experience in education.

Wellesley Women and Muskingum Women score the lowest on the projects in industry variable, in contrast to high scores of SMU Men and Rest of Men. Likewise, Wellesley Women and Muskingum Women are the lowest compared to SMU Men and Rest of Men on interaction with people from industry. The reverse is true for community projects which receive higher scores from Wellesley Women and Muskingum Women and low scores from SMU Men and Rest of Men.

Figure 6.11 32 Centour Diagram for Men and Women Based on Question 15 Discriminant Functions 1 and 2

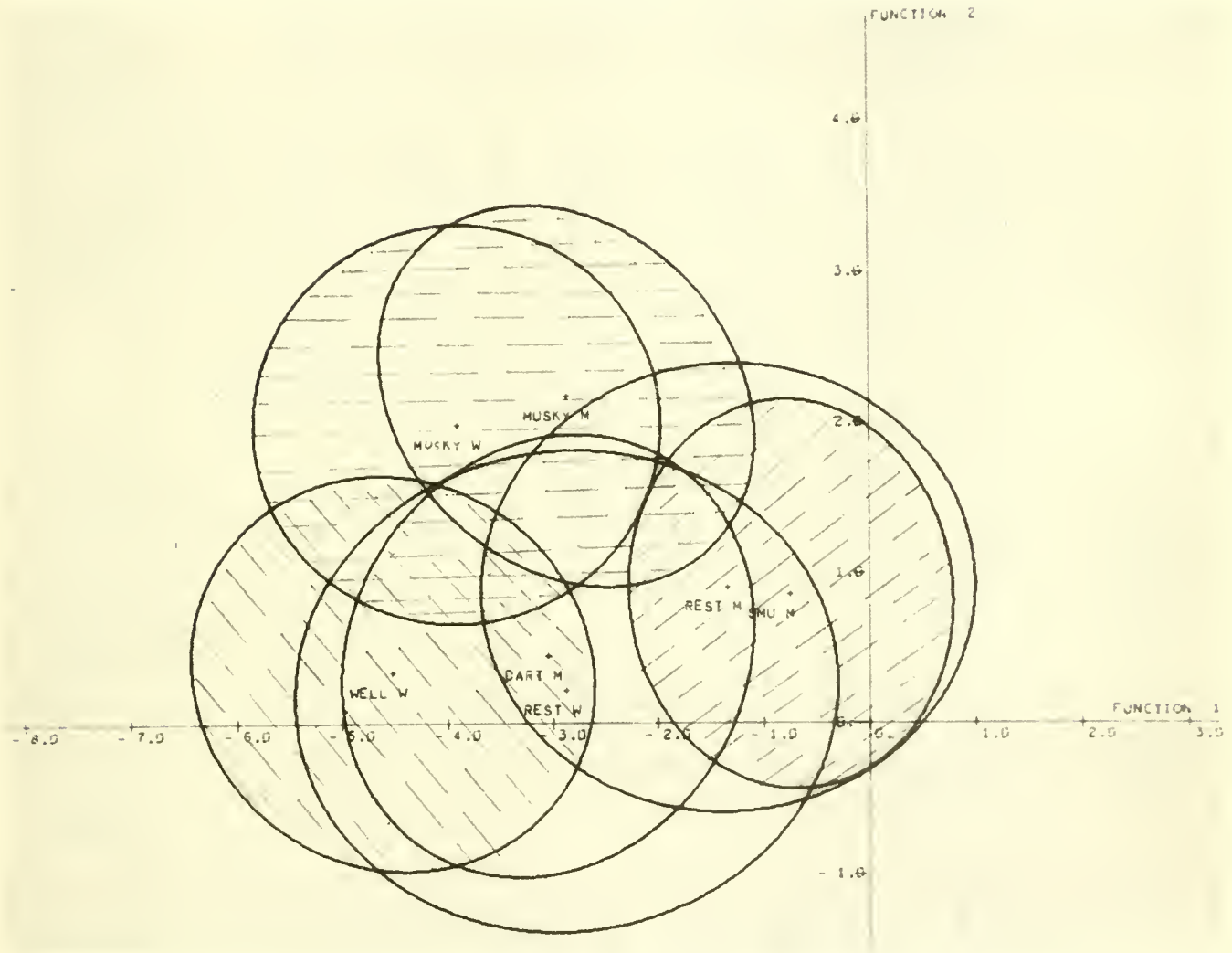


Table 6.13 Centours of Group Centroids Matrix for Men and Women
Based on Question 15

	VARIABLE	CENTROID GRP. 1 WELL W	CENTROID GRP. 2 MUSKY W	CENTROID GRP. 3 REST W	CENTROID GRP. 4 DART M	CENTROID GRP. 5 MUSKY M	CENTROID GRP. 6 SMU M	CENTROID GRP. 7 REST M
GROUP NUMBER 1	WELL W	100.0000	41.2082	72.7805	68.7265	15.3099	4.3288	36.1909
GROUP NUMBER 2	MUSKY W	40.3373	100.0000	48.4247	40.5253	70.6855	8.1655	41.2256
GROUP NUMBER 3	REST W	61.7041	33.8011	100.0000	53.2864	26.0155	27.3113	68.1602
GROUP NUMBER 4	DART M	66.2721	33.1839	58.2334	100.0000	30.7936	28.3109	59.0377
GROUP NUMBER 5	MUSKY M	22.7467	72.5846	33.5054	50.2617	100.0000	23.9670	51.9945
GROUP NUMBER 6	SMU M	12.3319	17.4096	49.7489	44.0089	35.8356	100.0000	95.5721
GROUP NUMBER 7	REST M	21.7661	29.3330	66.4129	54.5760	48.4156	91.3194	100.0000

SMU Men and Rest of Men show lower response to interaction with faculty than other groups. They also place less emphasis upon seminars, which Wellesley Women rate highly.

Muskingum Men and Women favor problem solving and homework prepared outside of class and group projects, in contrast to low rating by Dartmouth Men. Muskingum Women place more emphasis upon class discussions (high score) than Dartmouth Men (low score). Muskingum Men and Women score lower in peer group interaction than Wellesley Women and Rest of Women.

All women, especially Muskingum Women (high score) are more inclined to course lectures than the male groups (Dartmouth and SMU - low scores).

Figure 6.12 page 6-52 illustrates the discrimination based on Question 16,

> "Indicate the amount of change in yourself that you would like to take place this year as a result of your present studies."

A glance at the Centours of Group Centroids Matrix, Table 6.14 page 6-53 will point up the huge amount of overlap between sets when compared on Question 16. The greatest discrimination to be found occurs between SMU Men and Wellesley Women. (The overlap between Wellesley Women and SMU Men has been cross hatched in t plot to emphasize its slightness compared to the extreme overlap found between all other groups.) Overlap percentages for Wellesley and SMU in the Centour of Group Centours Matrix are only 9.7 and 30.0 respectively.

Four significant functions causing 93.6% of the discriminant power result in the analysis of sex-related groups on the learning outcome "Ability to..." variables, Question 16.

As noted for Question 15, business related questions are responsible for the greatest differences between Wellesley Women and SMU Men. For instance, the Wellesley Women variable contribution value for ability to sell ideas is significantly lower than the SMU Men value (high score) and Muskingum Men and Women value. Both Dartmouth Men and Wellesley Women place less emphasis

Figure 6.12 32 Centour Diagram for Men and Women Based on Question 16 Discriminant Functions 1 and 2

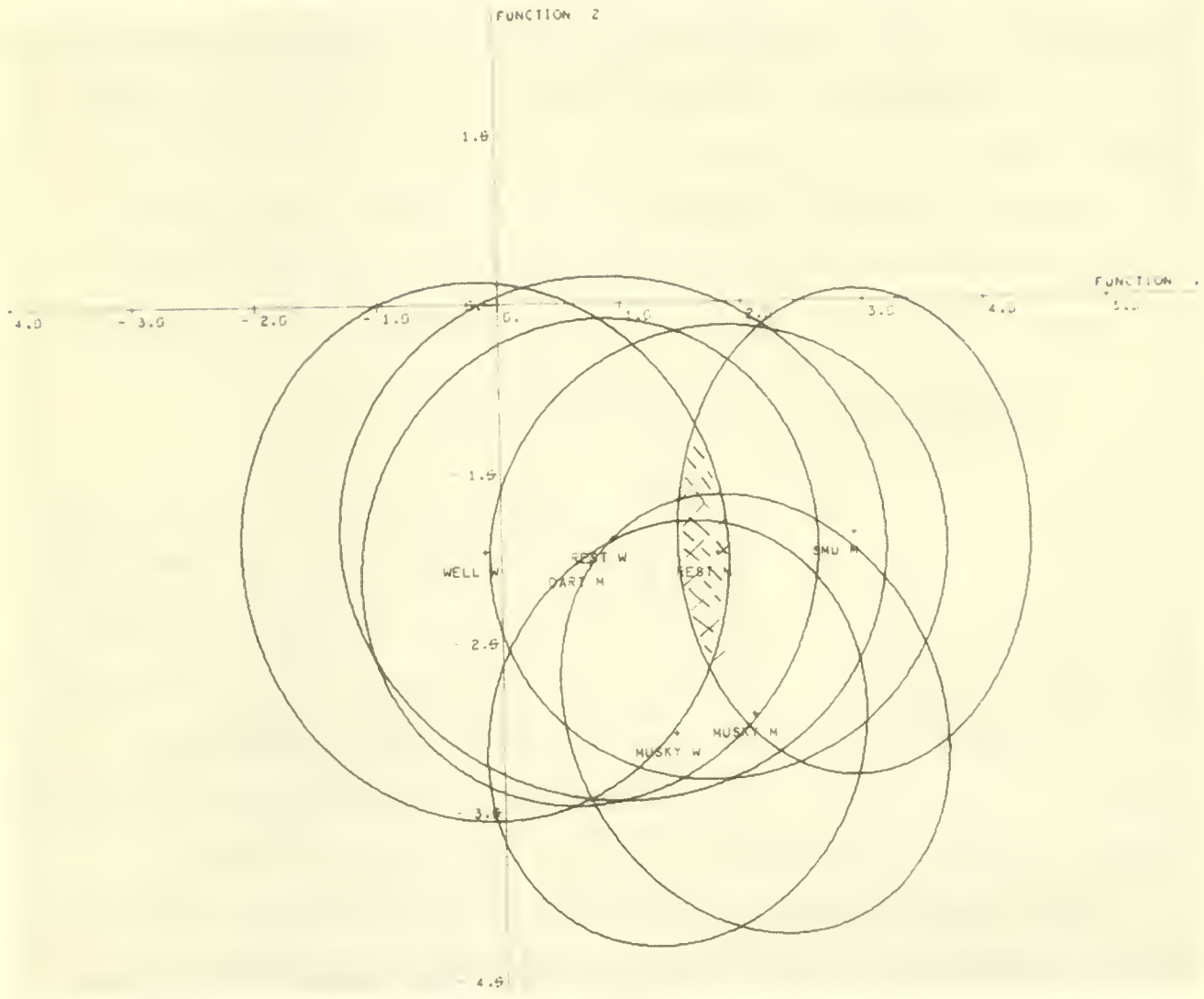


Table 6.14 Centours of Group Centroids Matrix for Men and Women Based on Question 16

	VARIABLE	CENTROID GRP. 1 WELL W	CENTROID GRP. 2 MUSKY W	CENTROID GRP. 3 REST W	CENTROID GRP. 4 DART M	CENTROID GRP. 5 MUSKY M	CENTROID GRP. 6 SMU M	CENTROID GRP. 7 REST M
GROUP NUMBER 1	WELL W	100.0000	27.1249	89.0778	72.5646	31.6885	9.7258	51.1445
GROUP NUMBER 2	MUSKY W	51.3484	100.0000	63.4458	62.9253	66.5161	37.2877	56.1042
GROUP NUMBER 3	REST W	85.7573	53.9507	100.0000	78.4001	54.3452	36.3493	78.1237
GROUP NUMBER 4	DART M	75.8946	47.2435	80.6415	100.0000	47.3765	30.5495	77.2759
GROUP NUMBER 5	MUSKY M	43.8615	68.5131	62.8333	41.9687	100.0000	58.9163	74.8483
GROUP NUMBER 6	SMU M	30.6713	43.3750	66.6465	42.2377	48.2547	100.0000	78.1264
GROUP NUMBER 7	REST M	61.6389	54.0350	82.6394	72.1593	74.1866	71.7829	100.0000

upon knowledge of business principles than do SMU Men. (Muskingum Men and Women and the Rest of Men also have significantly higher scores on this variable). Expected change in attitudes toward business is more important to SMU Men (high score) than Wellesley Women (low score). Muskingum Men and Women and SMU Men have higher scores on ability to apply techniques compared to Dartmouth Men. SMU has the highest value on ability to identify problems, and they join with Muskingum Women for the high scores on ability to make decisions. Muskingum Men, SMU Men and Rest of Men all place greater importance upon ability to induce change than the other groups. Muskingum Men and Women place the highest emphasis upon ability to do research, and changes in personal attitudes and values (Wellesley scores noticeably lower on the latter variable). Muskingum Women expect change in their attitudes toward people, in comparison to lesser expectations (low score) of Rest of Men.

Figure 6.13 page 6-55 is based on a discriminant analysis of responses to Question 29:

> "People differ in what is important to them in a job. In this section we have listed a number of factors which people might want in their work. Please rate ...how important each of these factors is to you."

Again, a great deal of significant overlap occurs between groups, yielding no generalizeable pattern of groups. Because of the large degree of agreement between most sets, the differences which do appear are more striking. In particular, Wellesley Women show no overlap on the plot with SMU Men. The Centour of Group Centroids Matrix Table 6.15 page 6-56 records minimal overlap between these data sets (1.1 and 23.0). The other two feminine groups, Muskingum Women and Rest of Women also reflect lower overlap values with the SMU Men (11.1, 23.3) and (11.2, 47.4). The Rest of Men category attracts high overlap values from its male counterpart groups, Muskingum Men, Dartmouth Men and SMU Men, and if it weren't for the Dartmouth Men and Rest of Women sets which tend to overlap with groups of the opposite sex, a clear polarity between sex groups

Figure 6.13 32 Centour Diagram for Men and Women Based on Question 29 Discriminant Functions 1 and 2

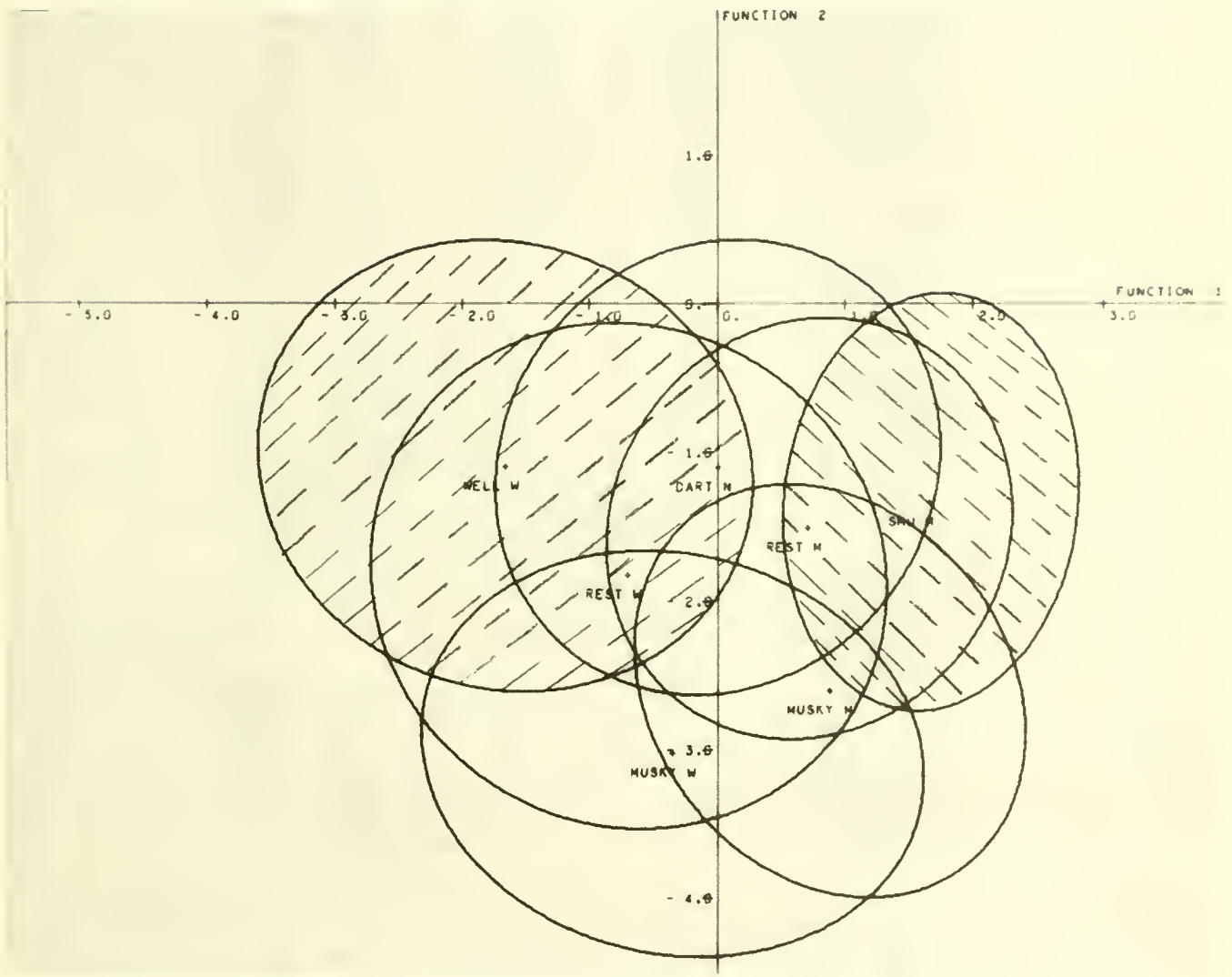


Table 6.15 Centours of Group Centroids Matrix for Men and Women Based on Question 29

VARIABLE	CENTROID GRP. 1	CENTROID GRP. 2	CENTROID GRP. 3	CENTROID GRP. 4	CENTROID GRP. 5	CENTROID GRP. 6	CENTROID GRP. 7
	WELL W	MUSKY W	REST W	DART M	MUSKY M	SMU M	REST M
GROUP NUMBER 1 WELL W	100.0000	31.8218	81.4472	54.3108	17.0187	1.0760	29.6322
GROUP NUMBER 2 MUSKY W	37.5216	100.0000	74.9980	44.3839	59.3524	11.0617	47.0507
GROUP NUMBER 3 REST W	79.5432	67.8272	100.0000	72.5139	46.6812	11.2230	64.5101
GROUP NUMBER 4 DART M	60.2813	29.1349	70.4493	100.0000	51.9032	21.5194	76.2243
GROUP NUMBER 5 MUSKY M	25.7069	71.1971	57.2886	51.3578	100.0000	45.7589	71.0279
GROUP NUMBER 6 SMU M	23.0225	23.2919	47.3895	57.8164	47.4430	100.0000	83.2939
GROUP NUMBER 7 REST M	46.1572	42.6467	75.3659	83.3396	69.4315	68.3734	100.0000

could be established.

Three significant functions explain 93.13% of the discriminant power.

Wellesley Women, the other feminine groups and Dartmouth Men all place less emphasis upon having an opportunity for high earnings than the rest of the groups (male). Likewise, Wellesley Women, Rest of Women and Dartmouth Men are less concerned about job security than the rest of the groups, especially Muskingum Men who had the highest score on the variable. Dartmouth Men and Wellesley Women also score lower than other groups on the importance of good physical working conditions.

SMU Men (and Rest of Men to a lesser degree) place considerable emphasis upon working for an organization with high prestige (Wellesley is low score). SMU Men also have higher scores than others on the importance of opportunities for advancement, and having a job with much authority. They are slightly higher on having a job which makes a real contribution.

Muskingum Men and Women stress the importance of a job with a reasonable work load, while deemphasizing the variable "Have considerable freedom to adopt your own approach to the job." Muskingum Men score lower than other groups on having challenging work to do.

Differences in Perception Data

The analysis of perceptions of self, ideal self and a typical manager is summarized by Figure 6.14 page 6-58 and Table 6.16 page 6-59. In only two instances does any one group show less than a third (33%) overlap with another set. Both instances involve Wellesley Women: the overlap between Wellesley Women and Muskingum Men (25.2, 26.8) and the overlap between Wellesley Women and SMU Men (18.7, 26.2). Three functions explain 95.93% of the discriminant power.

Wellesley Women and Dartmouth Men emphasize the negative aspects of the Sensitivity and Sincerity of a Typical Manager factor (insensitive, insincere, impatient, etc.) in contrast to the more positive attitudes of Muskingum Men and Women and SMU Men, who regard the Typical Manager in a more favorable light

Figure 6.14 32 Centour Diagram for Men and Women Based on Semantic Differential Perception Data Discriminant Functions 1 and 2

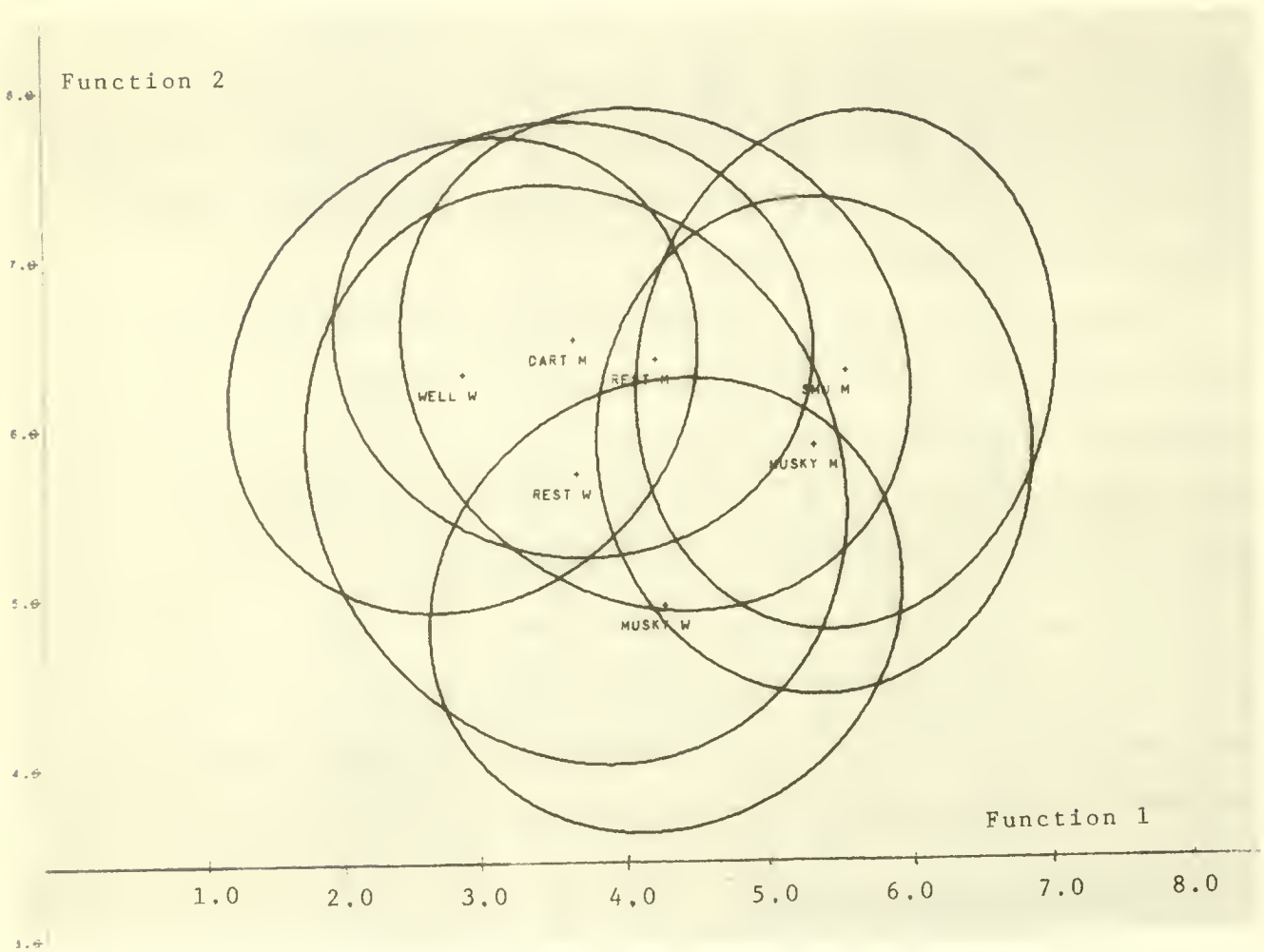


Table 6.16 Centours of Group Centroids Matrix for Men and Women Based on Semantic Differential Adjective Pairs

	VARIABLE	CENTROID GRP. 1 WELL W	CENTROID GRP. 2 MUSKY W	CENTROID GRP. 3 REST W	CENTROID GRP. 4 DART M	CENTROID GRP. 5 MUSKY M	CENTROID GRP. 6 SMU M	CENTROID GRP. 7 REST M
GROUP NUMBER 1	WELL W	100.0000	36.6201	86.9761	81.8547	25.1673	18.7100	71.9446
GROUP NUMBER 2	MUSKY W	35.1990	100.0000	72.3365	45.4132	63.6920	48.8349	61.9115
GROUP NUMBER 3	REST W	77.9236	69.1680	100.0000	68.9707	47.3111	40.0375	73.6555
GROUP NUMBER 4	DART M	83.1576	44.6423	79.5915	100.0000	50.1167	38.8095	93.9508
GROUP NUMBER 5	MUSKY M	26.7634	66.6918	56.4961	54.9952	100.0000	91.0990	79.2026
GROUP NUMBER 6	SMU M	26.2116	42.4416	53.9273	48.2692	88.0316	100.0000	72.4868
GROUP NUMBER 7	REST M	69.3426	54.8874	81.0131	93.3093	72.3252	63.6886	100.0000

on that factor. Wellesley Women describe themselves as being more emotional and personal than do other groups. Muskingum Men and SMU Men view themselves as more realistic than idealistic in both actuality (real self) and aspiration (ideal self), than other groups. Muskingum Men and Women have somewhat lower scores on the Personal Attributes of the Real Self factor (mature, cooperative, sincere, etc.) than the other groups.

SMU has the highest score on the Pride, Real and Ideal Self factor. Muskingum Men are second high on the factor in contrast to Muskingum Women who represent the low score.

Differences in Personal Opinions

The discriminant analysis of personal opinion data (illustrated by Figure 6.15, the plot of functions 1 and 2), provides the best separation between sex-related groups. In the accompanying Table 6.17, the Centours of Group Centroids Matrix, the statistical distances measured are much larger than most distances in previous questions. In contrast to the five question sets already discussed where overlap between groups is generally high, the discrimination based upon personal opinion data separates the seven groups into two relatively distinct groups:

1) Wellesley Women and Dartmouth Men (overlap 82.2, 76.7) and

2) Muskingum Men and Women (overlap 72.3, 56.8).

Group 1 is joined by Rest of Men by its overlap with Wellesley Women (46.4, 55.4) and with Dartmouth Men (76.0, 73.5). Group 2 also exhibits some similarity with SMU Men. (Muskingum Men overlaps with SMU Men 45.0, 39.5 and Muskingum Women overlap with SMU Men 57.6, 55.2).

The Wellesley/Dartmouth set does not show overlap with the Muskingum duo or with the SMU Men; the Muskingum Men and Women show much more overlap with SMU Men. The Rest of Women group shares space with all neighbors except the Muskingum Men. Likewise, the Rest of Men overlaps heavily with most other groups

Figure 6.15 32 Centour Diagram for Men and Women Based on Personal Opinion Data Discriminant Functions 1 and 2

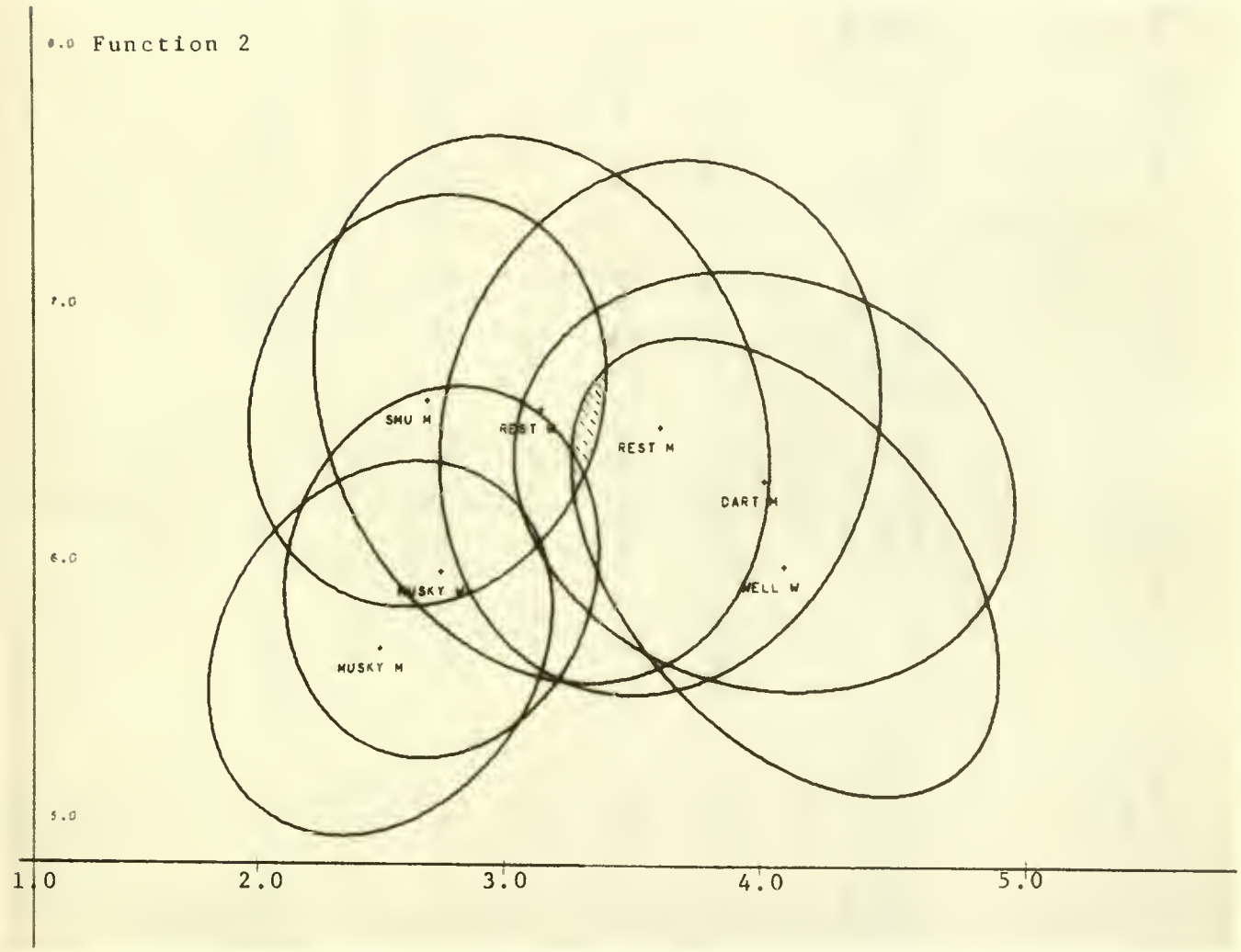


Table 6.17 Centours of Group Centroids Matrix for Men and Women Based on Personal Opinion Data

	VARIABLE	CENTROID GRP. 1	CENTROID GRP. 2	CENTROID GRP. 3	CENTROID GRP. 4	CENTROID GRP. 5	CENTROID GRP. 6	CENTROID GRP. 7
		WELL W	MUSKY W	REST W	DART M	MUSKY M	SMU M	REST M
GROUP NUMBER 1	WELL W	100.0000	7.5635	43.7102	82.1959	2.8681	6.8823	55.3833
GROUP NUMBER 2	MUSKY W	17.8166	100.0000	65.7970	31.7946	56.7918	57.6363	43.7719
GROUP NUMBER 3	REST W	41.9028	58.4052	100.0000	48.3921	15.5445	58.0461	61.8992
GROUP NUMBER 4	DART M	76.6843	7.1431	38.3604	100.0000	6.4140	13.9357	73.4692
GROUP NUMBER 5	MUSKY M	6.1117	72.3357	29.9396	16.8201	100.0000	45.0434	35.1877
GROUP NUMBER 6	SMU M	23.5968	55.2159	63.4428	39.3926	39.4946	100.0000	49.3810
GROUP NUMBER 7	REST M	46.4222	22.8118	63.7137	75.9692	16.5682	36.7427	100.0000

with the exception of the Muskingum pair. Because of the wide dispersions of the Rest of Men and Rest of Women and their central location it is difficult to clearly formulate a third distinct group.

Four significant functions explain 96.29% of the total discriminant power.

Wellesley Women and Dartmouth Men express a greater anti-protectionist point of view on the Unionism and Protectionism factor (e.g., "Management will usually do what is best for employers without outside influence from unions") than Muskingum Men and Women. They also score slightly higher on the Committee vs. Individual Management Factor, showing preference for group decisions.

Wellesley Women express somewhat more faith in the capabilities of the average worker (e.g., "The average worker in industry is capable of exercising self control") than other groups. The male groups, led by Muskingum Men all tend to lean toward the opposite opinion "The average worker in industry prefers to avoid responsibility, has little ambition, and wants security above all." Wellesley Women also are less cynical about business in general, as opposed to SMU Men.

Muskingum Men and Women tend toward Theory Y Management "A good manager should always be sensitive to the feelings of his subordinates" than other groups.

Dartmouth Men express greater cynicism regarding personal advancement ("The man who gets ahead in industry is the man who knows the right people"), especially compared to the low score of the Rest of Women.

Wellesley Women and Muskingum Men and Women are less concerned with corporate social responsibilities, compared to the Rest of Women, Rest of Men and SMU Men.

Variables Creating the "Polar Groups"

Throughout this analysis two groups consistently occupy positions at opposite sides of the centour diagrams. These "Polar Groups" are the Wellesley Women and SMU Men. In view of the magnitude and consistency of this discrimination it is useful to identify the variables responsible for this separation.

The variable contribution tables from the expectation, perception, and personal opinion analyses reveal one consistent, overriding and, from our point of view, highly useful difference between the two groups. The men invariably exhibit a greater interest in, or concern for, business related concepts and activities. They expect to learn more from projects in industry and interaction with people from industry. They expect to change in business skills, ability to sell ideas, knowledge of business principles, and attitudes toward business. They are more interested in opportunities for high earnings and jobs with authority but also more concerned with job security and organizational prestige. When choosing their school they based their choice on their field of interest and opportunities for specialization.

Wellesley women are the antithesis of the aspiring young SMU businessmen. They are more oriented toward academia and look forward to interaction with high quality faculty members and to seminars. They are interested in having "challenging" work to do, yet consider themselves to be more emotional and personal than the men. They are more cynical about the typical manager and more personally idealistic than the males.

Wellesley Women favor laissez faire labor policies and committee organizations while the SMU men opt for acceptance of unions and indicate concern over the efficiency of group discussions. The Women also place greater emphasis on

campus environment and facilities than the men.

The existence of these polar attitudes and expectations does not offer much encouragement to the female liberationists who look to the university as a source of new women power. The female expectations, self perceptions and attitudes closely parallel the traditional female image - emotional, idealistic, and personal, preferring education in pure academics, especially the arts, and somewhat cynical about and disinterested in the business world. Moreover, the most frequent student comments from Wellesley Women (and female respondents in general) bewail the presence of so many business-oriented questions and the paucity of "family" related items on our questionnaires. In contrast the majority of the men who commented on the questionnaire's business orientation were worried about negatively stereotyping the typical manager or concerned with questions that forced simplified answers to "complex problems" in which the right answer could easily be affected by circumstance.

Career Interests Analysis

Since the managerial focus of this study is on graduate education in management, we are particularly interested in the characteristics of undergraduates who might become MBA candidates. The career interest analysis was designed to determine if undergraduate students who profess an interest in graduate business education exhibit identifying characteristics, perceptions, or expectations which set them apart from undergraduate students with other career orientations.

Aspiring graduate students were identified by asking the undergraduates, "Do you wish to pursue graduate study at the Master's degree level?" "At the Ph.D. level?" (two questions). Students who answered either question affirmatively were asked to identify their expected field of graduate study. Table 6.18 page 6-66 summarizes the fields noted by respondents from each school who reported plans to pursue graduate work. Subject areas have been combined in the designated groupings to establish meaningful categories

		Boston College	Brandeis	Dartmouth	Muskingum	Southern Methodist	Wellesley	Northeastern	Total
athematics	Physics								
Math)	Math	2	4	9	13	4	1	5	38
	Physics	2	1	6	0	0	0	1	10
iology/									
hemistry	Biology	0	4	4	13	1	9	2	33
Biology)	Chemistry	0	1	4	6	0	2	0	13
umanities	History	3	2	3	9	0	3	2	22
Human)	Foreign Language	1	5	5	8	0	9	0	28
	English	6	2	5	3	0	7	4	27
	Philosophy	1	1	1	2	0	3	0	8
	Art	1	3	2	7	1	5	0	19
ocial	Economics	5	2	3	5	9	3	1	28
ciences	Political Science	2	4	8	3	1	2	1	21
Soc. Sci)	Sociology	2	4	3	9	5	9	2	34
	Psychology	5	12	5	15	3	15	6	61
rofessional	Engineering	0	0	3	4	0	0	24	31
Profess)	Law	24	5	43	20	123	18	13	246
	Medicine	9	7	27	11	6	10	8	78
ducation	Education	6	11	5	26	3	14	6	71
Ed)									
anagement	Management	38	3	26	10	178	4	30	289
Mgt)									
	Others	7	9	12	26	9	18	11	92
	Undecided	17	13	43	75	29	31	13	221
		131	93	217	265	372	163	129	TOTAL 1370

114 degress of freedom
X^2 value = 829.38
significant at .01

Table 6.18 Expected Fields of Graduate Concentration Reported by Undergraduates Planning to Enter Graduate School.

for analysis. The group names enclosed by parentheses in Table 6.18 will be used in the following analysis.

It is not difficult to isolate the differences between Wellesley and SMU respondents. One lonely SMU student is interested in graduate study in humanities (art) while 178 students plan to continue in business, and 123 intend to study law. Wellesley respondents in contrast, include only four students interested in business, and a broad representation in the humanities.

If Table 6.18 is indicative of undergraduate aspirations in 1969, there will be no lack of managers and lawyers in the coming decades. The small number of students expressing interest in the sciences, especially physics and chemistry suggests that the realities of the job market may already have been recognized by these undergraduates in 1969.

Demographic Differences Between Career Groups

Background information obtained from respondents in each of the career groups provided the first input to our assessment of career choice. Chi square analyses revealed eight items describing the student's background and five items related to undergraduate major and employment expectations that were significant at the .01 level. The eight background dimensions were: father's and mother's employment status and type of job, work experience, service in the armed forces, religious affiliation and religious practice. The five expectation variables were: expected employment, type of job, and salary, now and in twenty years. The extent of these differences suggests that career selection may be strongly influenced, and in some instances, pre-determined, by family background and student experience prior to the undergraduate learning experience.

Family Background and Career Choice

Forty-six percent of the undergraduates contemplating graduate study have fathers described as professionals (18%) and executives (28%). Twenty-three percent place their fathers in the "other" category which probably includes some of the twenty nine percent who are self employed. Thirty-three percent of all fathers work for a large company.

Twenty four percent of the students interested in entering a profession have professional fathers - the highest percentage in this category. Likewise executive fathers seem to produce aspiring executive sons.

Students interested in mathematics/physics exhibit a high incidence of teacher fathers and, as will be shown later, a significant percentage of math/physics students are predisposed to enter the academic world themselves. The interest group with the fewest professional and executive fathers is mathematics/physics, followed closely by humanities.

The question asking students to describe their mother's occupation does not include "housewife" as a possibility. Thus 28% of the mothers fall into the "other" category. A large percentage of the mothers of prospective graduate students teach (18%) or work in clerical jobs (33%). The significant chi square results are largely attributable to the number of students expecting to go into education and humanities who have professional mothers (15 and 11 percent respectively).

Religion and Career Choice

Religious affiliation and practice differ significantly among our career groups. However, the seven schools included in this research produce some definite biases. Professional and management group members from this sample are largely Protestant. Humanities have the largest number of students without

any affiliation. Thirteen percent of the math students describe their religious affiliation as "other". The mostly Protestant professional and management groups lead the field in classifying themselves as "somewhat religious." In contrast, thirty nine percent of the humanities group - the highest percentage among the seven groups on this item - indicate that they are "not at all religious."

Undergraduate Major and Graduate Study

We might expect the majority of students to continue to pursue their undergraduate major in graduate work. In view of the implications for graduate school promotion it will be useful to determine if this happens and with what consistency. It will also be important to identify striking shifts from one field to another. Table 6.19, page 6-70 can contribute to the resolution of these issues. However, we must remember the group compositions established earlier.

Since "humanities" is a conglomerate of six fields there is substantial room for within group shifts without dropping the humanities label. On the other hand transfers to any of the six areas would be credited to humanities. Actual transitions to humanities are made up of students with undergraduate majors in education, psychology and sociology. Eleven history majors, eleven education majors and fifteen business majors report plans to switch to the social sciences for graduate study. Graduate education incorporates undergraduates majoring in history, math, business and psychology, in addition to a large contingent of education students. Those planning graduate study in the professions (law, medicine, and engineering) are drawn from a heterogeneous undergraduate group dominated by political science, biology, engineering, and business majors. The graduate management group is made up of undergraduate engineers, economists and business majors.

Undergarduate Major Field	Field of Interest in Graduate Work						
	Math/ Physics	Biology/ Chemistry	Humanities	Social Sciences	Professions	Education	Management
History	2	0	19	11	22	5	2
Political Science	2	1	0	21	53	1	7
Philosophy	0	0	8	2	4	1	0
Art	0	3	14	1	2	3	0
Music	1	0	0	1	2	1	1
Foreign Language	1	0	22	4	4	3	0
English	0	0	23	5	10	1	2
Education	3	3	8	11	3	32	2
Physical Education	1	1	1	0	3	2	2
Biology	0	28	1	0	37	1	0
Psychology	2	0	5	49	7	10	2
Sociology	0	0	5	26	11	4	2
Chemistry	0	12	1	0	13	3	2
Mathematics	31	0	2	2	7	5	5
Physics	11	0	0	1	2	1	1
Engineering	0	0	2	0	31	0	18
Economics	0	0	0	19	20	2	18
Business	2	0	2	15	134	5	231

Table 6.19 Undergraduate Major Field and Expected Graduate Field Concentration

Experience and Career Choice

The samples studied reflected a general lack of outside experience representative of the majority of undergraduates in 1969. Ninety six percent of all males in the study had not yet served in the armed forces. The management group had the greatest relative proportion of veterans (8%). Eighty-seven percent of the students had no work experience. However, the group anticipating graduate study in management included the largest number with experience - 9% had two or more years work experience and 4% had worked more than five years.

Career Group Educational Expectations

In planning an educational program it would be most helpful to know whether students with different career objectives have divergent attitudes toward learning mechanisms and dissimilar change expectations. The educational expectations of future managers obtained through questions 15 and 16 are most widely divergent from those of students in biology/chemistry and the humanities as illustrated in Figure 6. 16 and Table 6. 20. The latter groups stress independent reading and independent research while management aspirants give the lowest rankings to these items. The humanities group has no use for projects in industry and interaction with people from industry but think class discussions are very important. Biology/chemistry students place greater value on research done with faculty members and laboratory experience but do not share humanities' aversion to management interactions. The management group, as could be expected, leans toward projects in industry, summer or school year jobs in industry and interaction with people from industry. Their negative attitudes toward independent reading and research, research done with faculty members and course lectures are not so easily anticipated. See Figure 6.16 page 6-72 and Table 6.20 page 6-73.

Figure 6.16 32 Centour Diagram of Undergraduate Career Groups Based on Educational Expectation Data Discriminant Functions 1 and 2

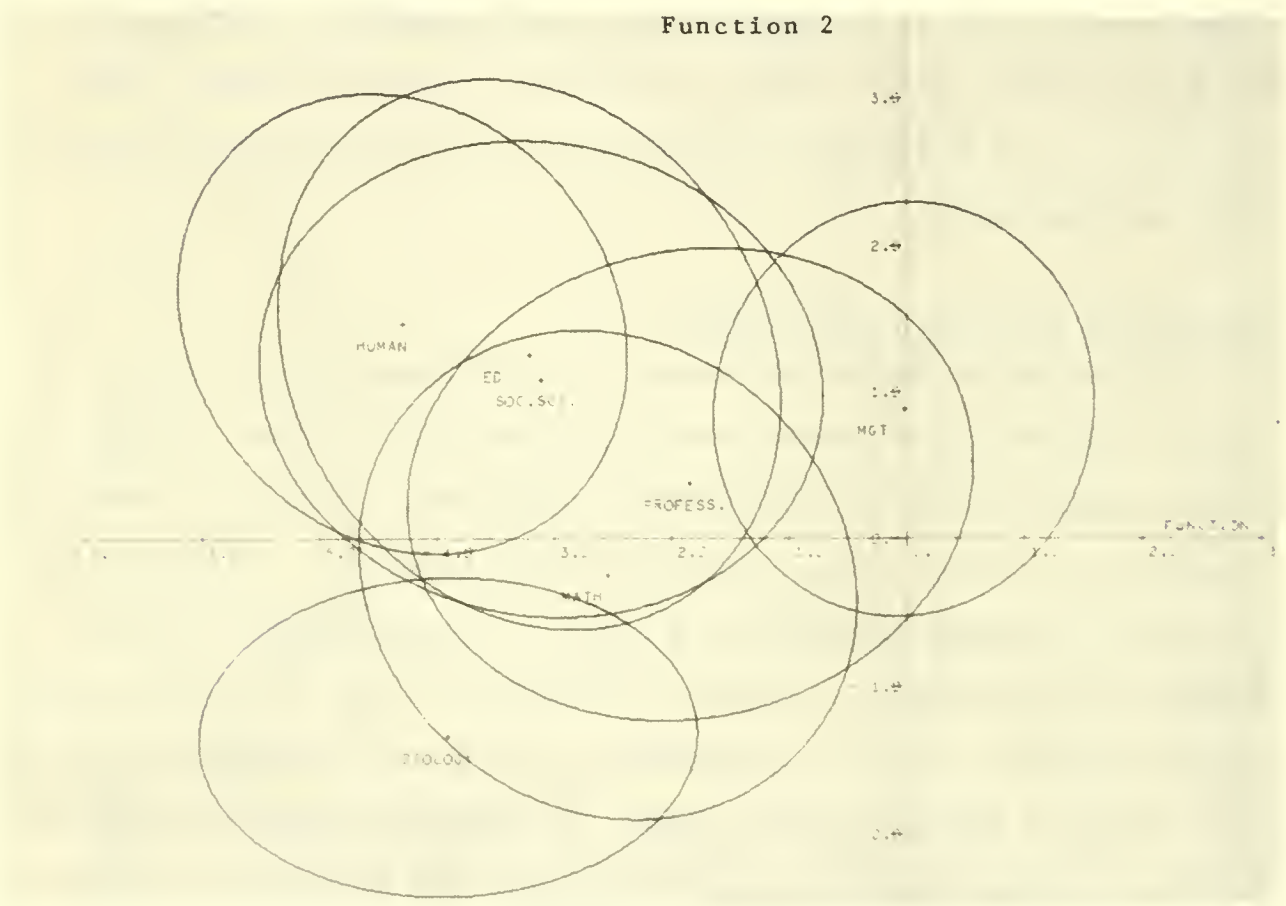


Table 6.20 Centours of Group Centroids Matrix for Undergraduate Career Groups Based on Educational Expectations

	Centroid Mathematics	Centroid Biology	Centroid Humanities	Centroid Social Sciences	Centroid Professional	Centroid Education	Centroid Management
Mathematics	100.0000	41.9387	40.7874	63.0528	83.4642	61.6711	22.1028
Biology	58.3953	100.0000	19.1657	27.7513	41.9543	29.6699	1.8361
Humanities	44.4783	2.3302	100.0000	62.1959	37.7568	47.6187	2.6898
Social Sciences	62.3952	7.5928	74.8692	100.0000	76.2233	96.9856	14.0906
Professional	80.8518	17.7651	38.6644	80.1756	100.0000	75.6842	49.3423
Education	46.9032	5.2208	67.3111	96.1820	64.8785	100.0000	10.0278
Management	35.2282	1.9307	7.4695	43.8386	71.6817	33.0060	100.0000

Discrimination between biology/chemistry and humanities, based on Function 2 in Figure 6.16 is best explained (21% of the variation) by biology/chemistry's greater concern with research done with faculty members and laboratory experiences.

Aspiring biologists understandably hope to experience greater change in their ability to do research than do the business oriented students who predictably looked forward to change in knowledge of business principles.

Job Expectations and Career Choice

Fifty five percent of those contemplating graduate study in management expect their first job to be with a large company. Another 28% expect to work in a small company, yielding a total of 83% who expect to work in the private rather than the public sector.

Educational or teaching positions are the primary objective of 29% of the social science, 35% of the math/physics, 59% of the humanities, and 79% of the education students.

Jobs with Government or non-profit agencies and working for yourself receive low percentages from all prospective graduate groups.

Twenty year employment expectations reveal markedly altered job preferences. Forty two percent of all students with graduate school aspirations hope to be working for themselves by 1990. The heaviest contributors to the "self" category are management students (52%) and those focused on the professions (56%). Forty one percent of the Math students and 33% of the managers plan to stay with big business.

The lowest first job salary expectations are exhibited by students planning to enter graduate school in the humanities, social sciences and education. However, the vast majority of all students (83%) expect to have initial incomes in the $5,000 to $15,000 per year range. Twenty year salary expectations are

more divergent. A clear majority of the students in math/physics (75%), biology/chemistry (74%), humanities (86%), social sciences (69%) and education (89%) expect to earn between $5,000 and $30,000 per year. In fact most fall into the $10,000 - $20,000 range. For students in management and the professions this same salary range encompasses only 33% of the group; leaving 67%, who expect to be earning more than $30,000 in twenty years. 28% of the prospective managers and 27% of the aspiring professionals expect to be in the $50,000 to $100,000 bracket, while 6% of professionals and 8% of the management students expect incomes in excess of $100,000. All fields considered, 51 students, or 5% of the total questioned expect to be earning over $100,000 by 1990.

Students planning graduate study in management and the professions generally expect to end up working for themselves and receiving substantial compensation. Students planning graduate work in other fields have less grand expectations and future plans that follow largely traditional lines.

Discriminant analysis of factors considered when choosing a job (Figure 6.17 page 6-76) separates would-be managers from those committed to education, socia sciences and the humanities. Management students emphasize: (1) opportunities for high earnings; (2) opportunities for advancement; and (3) the authority associated with a job. In contrast, the liberal arts groups attached the least significance to these job factors.

Career Group Perceptions and Opinions

Analyses of semantic differential perception items (Figure 6.18 page 6-77) and managerial opinion responses (Figure 6.19 page 6-78) failed to identify significant differences between career groups. It is particularly interesting to note the homogeneity of responses to the perception questions. Likewise the opinions of prospective managers do not differ significantly from those of their non-business oriented colleagues.

Figure 6.17 32 Centour Diagram of Undergraduate Career Groups Based on Job Expectations Data Discriminant Functions 1 and 2

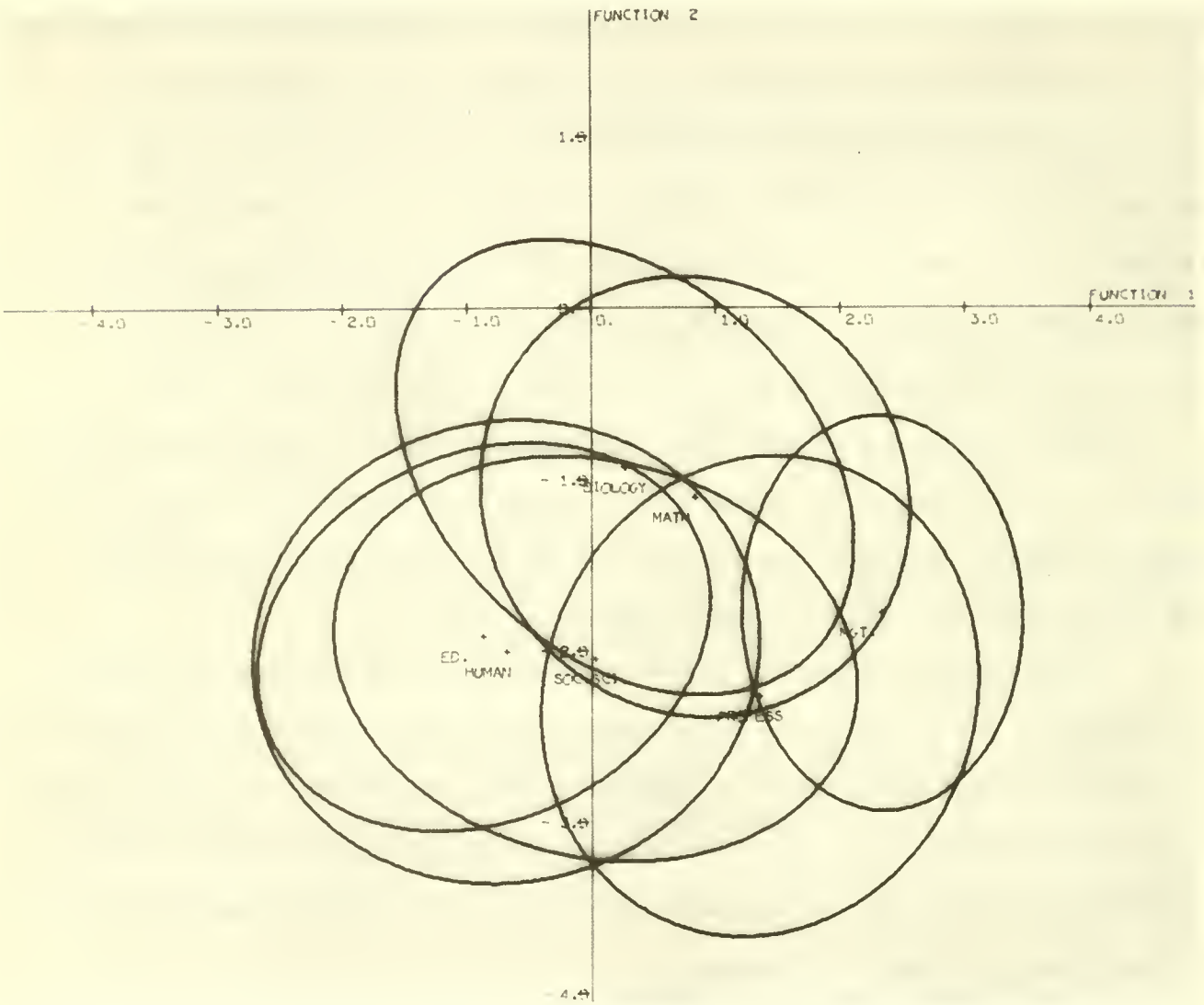


Figure 6.18 32 Centour Diagram of Undergraduate Career Groups Based on Semantic Differential Perception Data Discriminant Functions 1 and 2

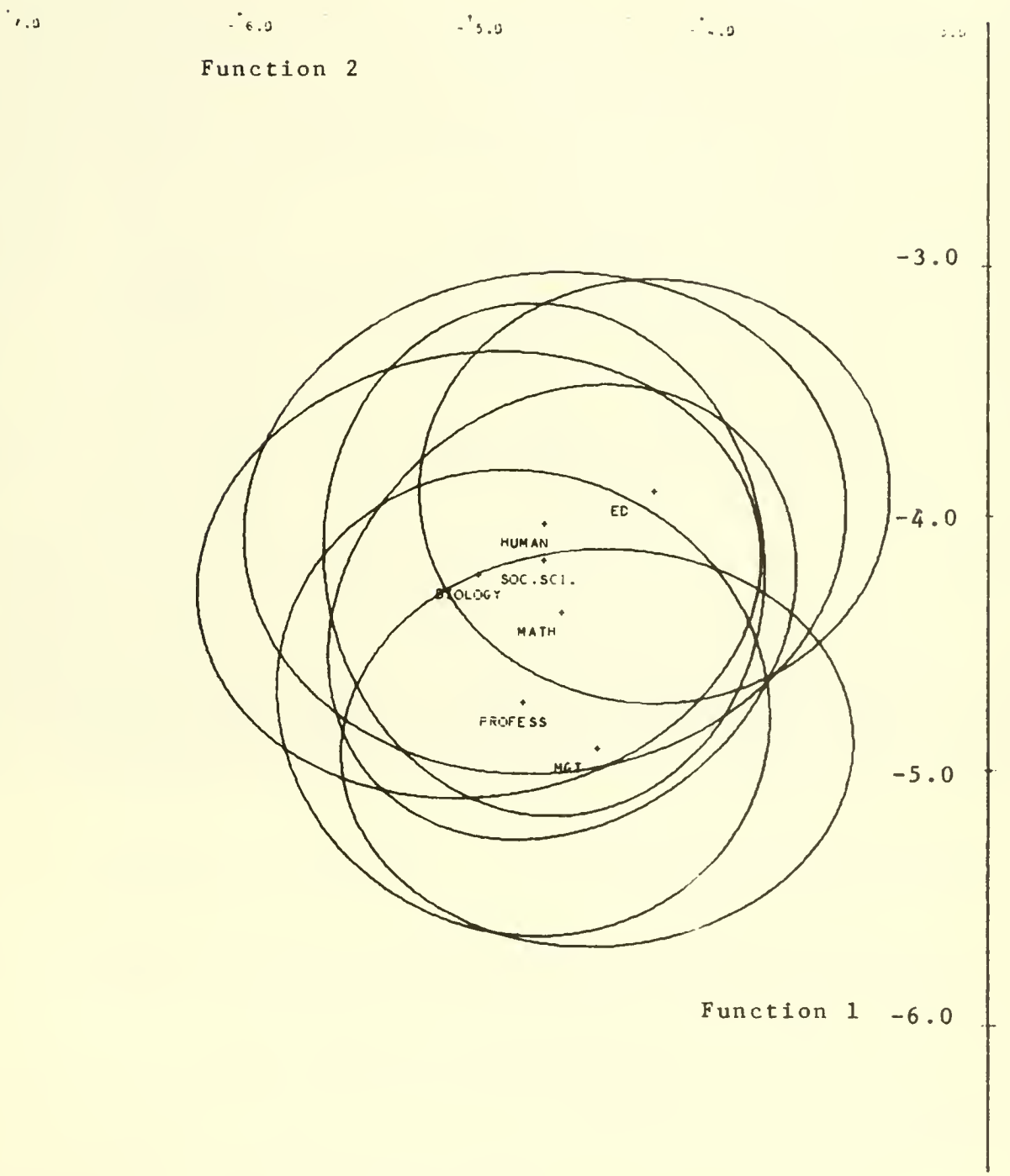
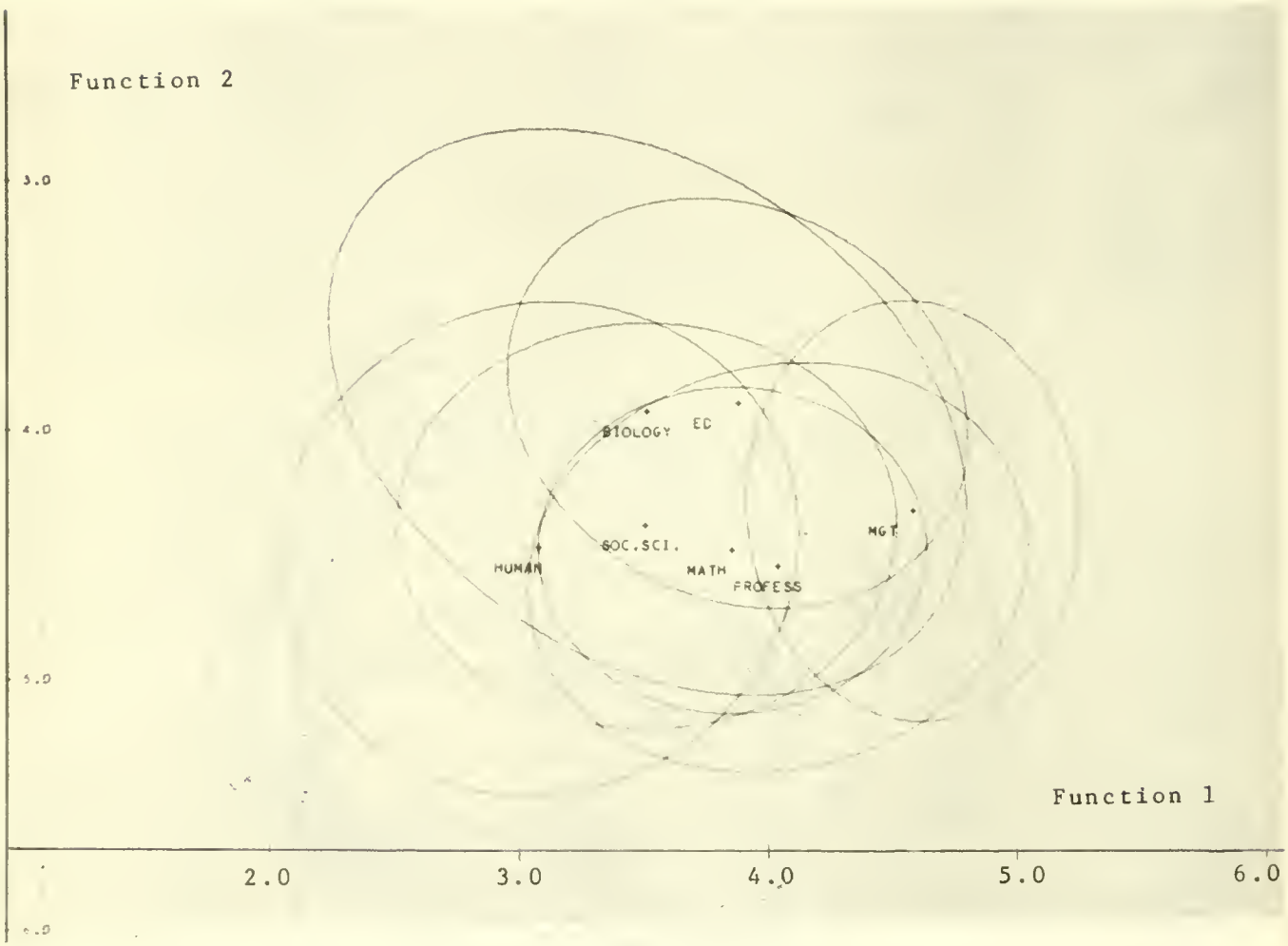


Figure 6.19 32 Centour Diagram of Undergraduate Career Groups Based on Personal Opinion Data Discriminant Functions 1 and 2.



Chapter 7

The Graduate Admissions Process

"People don't ask for facts in making up their minds. They would rather have one good, soul-satisfying emotion than a dozen facts."[1]

The expectations and perceptions developed or maintained during the undergraduate experience motivate some students in each graduating class to apply for admission to one or more graduate schools. This chapter is concerned with that portion of the group who apply to graduate schools of management. Its objective is to answer three questions.

1) What are the similarities and differences among applicants to various types of graduate management programs?

2) What is the nature and effect of admissions procedures used to select among applicants?

3) What factors determine whether a prospective graduate student will attend a program once his application is accepted by the institution?

The managerial concerns motivating our interest in each of these questions are directly related to the process model outlined in Chapter 3. Specifically:

1) Identification of the expectations and perceptions motivating application to particular programs will contribute to the manager's ability to communicate relevant information about his program to potential applicants and to anticipate the priorities of entering students

2) Examination of the admissions process at one school will provide a framework for the evaluation of alternative selection procedures and admission criteria

3) Isolation of factors affecting student decisions to attend programs to which they are admitted will help the manager anticipate, perhaps even influence, his ultimate "mix".

Applicant Perceptions and Expectations

The examination of undergraduate career expectations in Chapter 6 suggested

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[1] Leevitt, Richard K., Voyages and Discoveries.

that students considering graduate study in management differed from their colleagues contemplating other occupations in several significant respects. We turn now to the data supplied by students who actually entered the five graduate schools of management encompassed by this study -- The Amos Tuck School of Business Administration at Dartmouth, Boston College Graduate School of Business Administration, the MIT Alfred P. Sloan School of Management, Stanford University Graduate School of Business, and Southern Methodist University School of Business Administration.

The first step in this analysis is to determine whether applicants to graduate schools of business have definite reasons for choosing a particular school. If certain perceptions or expectations rank high in the students' evaluative scheme, it will be useful to establish the consistency of these ideas within and among the groups applying to particular schools.

Investigation of these issues focuses our attention on responses to Question 22 of the Pre-Term Questionnaire obtained from students entering the five graduate schools of business. The 783 students included in this part of our study were asked to describe the relative importance they attached to each item in the following list of graduate school descriptors.

a. Quantitative emphasis
b. Research opportunities
c. Qualitative emphasis
d. Strength in your field of interest
e. Social opportunities
f. Size of school
g. Opportunity for specialization
h. Prestige of school
i. Required courses
j. Case studies
k. Integrated program
l. Practical experience available
m. Location
n. Cost and financial aid offered
o. Faculty
p. Campus environment and facilities
q. Breadth of program
r. Type of student attending
s. Community involvement

Factors Influencing Applicants Choice of School

Respondents were asked to indicate the importance of each factor and whether it was a positive or negative consideration in their rating of the graduate school. A seven point scale was used to report views ranging from 1 = important and negatively viewed through 4= unimportant, to 7= important and positively viewed.

Determination of the absolute importance attached to each characteristic thus requires that we consider the magnitude of the response without regard to valence (+ or -). Since impressions were reported on the seven-point scale with 4 as the neutral midpoint, the importance of item 'i' can be computed as:

$$\sum_{n=1}^{N} \left| \text{Pre Term } 22_{i,n} - 4 \right|$$

where: $\text{Pre Term } 22_{i,n}$ ≡ Respondent n's assessment of characteristic i in Pre Term Questionnaire Question 22.

N ≡ Total number of respondents answering Question 22.

The importance attached to each characteristic by members of the combined graduate school sample is summarized in Table 7.1 which ranks the results obtained by applying this normalized absolute value sum to responses for each item in Question 22. See Table 7.1 page 7-4.

Three of the four items considered most important by the population as a whole relate to non-academic aspects of the school environment -- location, prestige and cost. Only one academic consideration, field of specialization, ranks within the top four.

In view of the alleged emphasis on "relevance" and community action on the part of college students during the period of this study, it is significant to note that the least important characteristic as viewed by the population as a whole is "community involvement".

One might expect that experience would have a significant affect on student

Table 7.1

Relative Importance of Question 22 Items as
Evaluated by All Entering Graduate Students in Sample

Absolute Value Sum	Item
1075	Location
1000	Prestige of school
824	Field of specialization
791	Cost and financial aid offered
787	Breadth of program
778	Campus environment
768	Size of school
736	Faculty
694	Quantitative emphasis
692	Integrated program
690	Type of student attending
681	Social opportunities
666	Qualitative emphasis
649	Opportunity for specialization
623	Case studies
616	Required courses
559	Practical experience available
548	Research opportunities
476	Community involvement

values and priorities and thus change the relative importance rankings assigned by applicants with two or more years of non-academic experience as opposed to students coming directly from the undergraduate environment. This is not the case when students from all five schools are considered as a single population. Experience does produce significant differences within school groups, however, and this condition will be discussed later in this chapter.

The four most important items ranked by students entering each of the five graduate schools are summarized in Table 7.2. Five attributes appear in the top four items for more than one school. Location is noted by applicants to four schools. Prestige and cost (financial aid offered) are among the first four items noted by applicants to three schools. Field specialization and faculty are among the top four in importance for two schools. However, no one attribute is universal, i.e., spans all five schools. See Table 7.2 page 7-6.

Even the apparent commonalities may be deceiving. There are sizeable differences among schools even among highly rated common items. Table 7.3 provides a rough indication of the relative importance of highly rated items to applicants in each school. Entries in this table present the normalized absolute importance score for each attribute as well as the percentage of the cumulative total importance scores for all items represented by the attribute in question. Particularly wide differences are noted in the percentages associated with prestige, field of interest, and location. Although the common items are important in all schools, students at some institutions attach greater significance to certain items. See Table 7.3 page 7-7.

Differences among Applicants to Five Graduate Schools

These findings lead naturally to the question of which attributes have the greatest relative importance to students applying to particular schools. Before we can answer this question, it is necessary to normalize the responses from each school to take account of differences in respondent population size.

Table 7.2

Four Most Important Attributes as Perceived by Applicants to Five Graduate Schools

School	Item	Absolute Value Sum
Sloan	Prestige of school	233
	Field of specialization	215
	Quantitative emphasis	185
	Faculty	177
Stanford	Prestige of school	265
	Location	228
	Faculty	187
	Cost and financial aid	181
Southern Methodist	Location	277
	Cost and financial aid	164
	Field of interest	161
	Breadth of program	140
Amos Tuck	Prestige of school	232
	Size of school	222
	Campus environment	192
	Location	186
Boston College	Location	212
	Social opportunities	170
	Cost and financial aid	150
	Integrated program	160

Table 7.3

Relative Importance of Common Items

Item	School	Item Score	Percentage (of)	Cumulative Total
Prestige	Sloan	233	8.4	2790
	Stanford	265	8.8	3023
	Southern Methodist	134	5.6	2408
	Amos Tuck	232	8.0	2912
	Boston College	136	5.4	2520
Location	Sloan	172	6.2	2790
	Stanford	228	7.5	3023
	Southern Methodist	277	11.5	2408
	Amos Tuck	186	6.4	2912
	Boston College	212	8.4	2520
Field of Specialization	Sloan	215	7.7	2790
	Stanford	167	8.8	3023
	Southern Methodist	161	6.7	2408
	Amos Tuck	168	5.8	2912
	Boston College	113	4.5	2520
Cost and Financial Aid	Sloan	167	6.0	2790
	Stanford	181	6.0	3023
	Southern Methodist	164	6.4	2408
	Amos Tuck	129	4.4	2912
	Boston College	150	6.0	2520
Faculty	Sloan	177	6.3	2790
	Stanford	181	6.0	3023
	Southern Methodist	106	4.4	2408
	Amos Tuck	160	5.5	2912
	Boston College	106	4.2	2520

This is done by computing a normalized importance score as follows.

$$\sum_{n=1}^{N_s} \left|\text{Pre Term } 22_{i,n} - 4\right| \cdot \frac{NMAX}{N_s}$$

where: $N_s \equiv$ Number of respondents answering Pre Term uestion 22 in School 's'

$NMAX \equiv$ Maximum value of N_s in any school

This normalized score enables us to identify the attributes having the greatest relative importance to each school. Table 7.4 was produced by assigning each of the 19 attributes to the school producing the highest normalized score on that item. (See Table 7.4, page 7-9).

Examination of the actual response distributions for items yielding high normalized importance scores reveals a high degree of skewness indicating substantial consistency in respondent perceptions. Sample distributions for selected schools and attributes are illustrated in Figure 7.1, page 7-10.

Comparison of common item graphs (e.g., location) in Figure 7.1 suggests that response distributions are significantly different at different schools. Chi-square analysis of responses data for all schools on each attribute verifies this suspicion. Response distributions for 13 of the 19 characteristics are significantly different at the .05 level while 10 items are significant at the .01 level. Specific results are summarized in Table 7.5, page 7-11.

Now that we are working with individual school responses, it is appropriate to ask whether any of the top four items noted for a school in Table 7.2 effectively separate students attending that school from those admitted to all others. Approaching this question with a chi-square analysis, we ask whether responses for a particular school appear to be significantly different from those of all other schools in combination and from each other school considered separately. Conclusions based on this analysis are summarized in Table 7.6, page 7-12.

Table 7.4

Attribute Assignment Based on Highest Normalized Importance Score

Sloan

Field of Interest (215)

Quantitative emphasis (185)

Opportunity for specialization (150)

Research opportunities (136)

Amos Tuck

Size of school (222)

Campus environment (192)

Breadth of program (178)

Stanford

Prestige of school (265)

Faculty (187)

Cost and financial aid offered (181)

Type of student attending (173)

Case studies (155)

Required courses* (134)

Practical experience available (122)

Community involvement (122)

Boston College

Social opportunities (170)

Integrated program (160)

Qualitative emphasis (153)

Southern Methodist

Location (277)

Required courses* (134)

---

*Tie

Figure 7.1

Response Distributions for Five Graduate Schools
on Selected Question 22 Attributes

SLOAN

Field of Specialization

0	1	
2	2	X
4	3	XX
12	4	XXXX
15	5	XXXXX
32	6	XXXXXXXXXX
42	7	XXXXXXXXXXXXX

Prestige of School

1	1	X
0	2	
3	3	X
5	4	XX
16	5	XXXXX
35	6	XXXXXXXXXX
45	7	XXXXXXXXXXXXX

STANFORD

Prestige of School

0	1	
0	2	
0	3	
2	4	X
5	5	XXX
14	6	XXXXXX
34	7	XXXXXXXXXXXXXX

Location

0	1	
0	2	
1	3	X
2	4	X
10	5	XXXX
21	6	XXXXX
21	7	XXXXX

SOUTHERN METHODIST

Location

0	1	
2	2	X
1	3	X
1	4	X
2	5	X
17	6	XXXXXXXX
41	7	XXXXXXXXXXXXXXXXXXX

AMOS TUCK

Size of School

5	1	XX
2	2	X
2	3	X
15	4	XXXX
7	5	XXX
34	6	XXXXXXXXXX
40	7	XXXXXXXXXXXX

BOSTON COLLEGE

Location

0	1	
1	2	X
1	3	X
5	4	XXXX
9	5	XXXXXXXX
16	6	XXXXXXXXXXXXXX
18	7	XXXXXXXXXXXXXXXX

Table 7.5

Chi Square Analysis of Response Distributions For Five Graduate Schools

Item	Significance*	X^2 Value
1. Quantitative emphasis	.01	69.807
2. Research opportunities	.01	66.344
3. Qualitative emphasis	---	21.553
4. Strength in your specific field of interest	.01	54.083
5. Social opportunities	.01	43.325
6. Size of school	.01	100.794
7. Opportunity for specialization	---	31.387
8. Prestige of school	.01	130.703
9. Required courses	---	27.572
10. Case studies	.01	69.283
11. Integrated program	.01	43.821
12. Practical experience available	---	25.344
13. Location	.01	82.057
14. Cost and financial aid offered	---	34.982
15. Faculty	.01	74.432
16. Campus environment and facilities	.05	42.227
17. Breadth of program	---	24.194
18. Type of student attending	.05	37.870
19. Community involvement	.05	36.694

*Seven response categories and five schools yield twenty-four degrees of freedom.

Table 7.6

Results of Chi Square Analysis to Isolate "Unique"
Response Patterns Among Top Four Attributes in Table 7.2

School	Unique Attributes*	Remarks
Sloan	Quantitative emphasis	X^2 (among pairs of schools) shows Sloan to be significantly different from all other schools at .01 level. This attribute also received the highest normalized importance score of all schools (185).
Stanford	None	All of Stanford's top four items are included in the top four rankings of some other school.
SMU	Breadth of Program	X^2 shows no significance among or across schools on the Breadth of Program dimension. Although it is one of SMU's top four ratings, other schools rated the item higher - without their scores entering into the top four rankings of their schools.
Amos Tuck	Size of School	On Size of School, Amos Tuck is significantly different from all other schools at the .01 level. Amos Tuck has the highest normalized score (222) on this item.
	Campus Environment	On the Campus Environment item, Amos Tuck is only significantly (.01) different from SMU, although it has the highest normalized importance score (192) of all schools on this dimension.
Boston College	Social Opportunities	Boston College is only significantly different from Stanford, .05 on the social opportunities dimension, although it has the highest normalized importance score (170).
	Integrated Program	Integrated program - Boston College is only significantly different (.05). from Amos Tuck on the Integrated Program dimension. However, it has the highest normalized importance score (160) on this item.

*Unique attributes are those attributes (displayed in Table 7.2) which appear as one of the four highest importance scores for only one school, e.g., the item Quantitative Emphasis received a high importance rating at the Sloan School only; it did not receive a similar ranking at any other school.

Information Sources

Given that a student has decided to further his education, what information sources motivate him to apply to a specific institution? If we are to adopt the market-oriented approach to education suggested in Chapter 4, it would be particularly useful to know: what type of information reaches prospective applicants; how often; what "advertisements" produce requests for information; what demographic units justify saturation coverage; and what is the rate of return on faculty visits as opposed to catalogue distribution? Although this topic was not a primary focus for this research project, it is a relatively simple matter to gain basic data regarding sources of information that were available and used by entering students when they applied to particular graduate schools. Master's candidates at the Sloan School were asked,

> "On the average, what percentage of meaningful information about ...business schools did you receive in the following ways?"
>
> _____% Catalogues of each school
> _____% Outlines in ATGSB - type handbooks
> _____% Direct counseling at your last school
> _____% General word of mouth
> _____% Other (specifically - _____)
>
> _____% = 100%

Seventy-two of approximately 200 potential respondents answered this questionnaire and final responses were divided equally between first and second year students - 36 per class. Table 7.7, page 7-14, summarizes responses in each category by first and second year students and the total sample.

Responses from first and second year students show only minor percentage point differences. "Word of mouth" received the highest average percentage in the total sample (39.05) followed by "Catalogues of each school" (32.58). Fifteen of the 24 students who answered in the "Other-specify _____" category indicated that interviews and visits to schools were responsible for an average of 33% of the "meaningful information" received.

Table 7.7 Sources of Meaningful Information

	Average Percentages		
	First Year	Second Year	Total Sample
Catalogues of each school	28.44	36.72	32.58
Outlines in ATGSB type handbooks	3.47	4.44	3.95
Direct counseling at your last school	15.50	12.72	14.11
Word of mouth	42.00	36.11	39.05
Other	10.58	10.00	10.29

Students were also asked about the number of applications to business school they had made and the names of these schools.

Fifty-six of the 77 students polled at Sloan had applied to three or more graduate schools of business; 31 submitted four or more applications and 15 reported applying to five or more schools. (One student had arduously completed and submitted eight different applications, which at the going rate of $15.00 per application represented an investment of $120.00!)

The current applicant overlap and associated competition among major graduate management schools is well illustrated by a tabulation of the other schools to which students ultimately enrolling in M.I.T. had applied. Thirty-eight students had also applied to Harvard, 29 to Stanford, 19 to Chicago and 15 to both Columbia and Wharton. One hundred sixteen of the 173 applications submitted to other schools were received by these competitors. The only solace is that these students came to Sloan.

When asked, "Did your attitudes toward management education change during the process of selecting a business school?" 29% of the sample responded "yes" and 71% "no". Nine students who responded "yes" reported changed attitudes relating to a quantitative orientation to management. Awareness of the case method of teaching changed the attitudes of 4 students while "Program flexibility" and "Number of electives" were noted as attitude change catalysts by 3 students. This attitude change toward Management education appears to have grown out of increased knowledge of the business schools and their offerings.

Ninety-five percent of the student response data indicated that their "attitudes toward management careers" did not change during the process of selecting a business school.

The Impact of Experience on Applicant Assessment

Earlier in this chapter we commented that students with experience did not appear significantly different from those admitted directly from school when the samples from all five schools were combined. Let's see what happens when the expectations of students with two or more years experience admitted to each school are compared with their classmates who have only academic experience. Table 7.8, page 7-17 summarizes the sample structure on which this analysis is based.

Chi-square analysis of this samples responses to question 22 produces the results summarized in Table 7.9. The first column identifies the applicable school. The second column specifies the characteristic, the third significance of the X^2 test. The last six columns specify the percentage of experienced and inexperienced students responding in each of these response ranges: 1 through 3 (negative), 4 (neutral), 5 through 7 (positive). See Table 7.9, page 7-18.

The overall impression emerging from Table 7.9 is that students with experience are less impressed with (or more critical of) most significant attributes than are their less experienced colleagues. Focusing on the .01 level significance items we see that the experienced students of Amos Tuck and Boston College are less satisfied with the research opportunities offered by these institutions. Those with experience admitted to Boston College are also less positive about the institution's opportunities for specialization, practical experience available and costs and financial aid. S.M.U. applicants with experience are relatively negative in their assessment of the social climate on campus and school size.

The Admission Process

As the first point in the educational sequences potentially controlled by the manager of graduate education, the admission process was of particular interest in this study. Comparative analysis of the entering student characteristics (to be described in Chapter 8) offer an opportunity for indirect analysis of the impac

Table 7.8

Experienced and Inexperienced Students At
Five Graduate Schools

School	Population Size			
	Inexperienced	Experienced	Experience Unknown	Total
Amos Tuck	36	125	1	162
Boston College	143	34	12	189
Sloan School	44	66	1	111
Southern Methodist	202	54	1	257
Stanford	30	32	2	64
Total	455	311	17	783

Table 7.9

Significant Differences in Experienced and Inexperienced Student Reasons for Applying to Five Graduate Schools

School	School Characteristic	Significance Level	Percentage in Each Response Range: Experienced 1-3	Experienced 4	Experienced 5-7	Inexperienced 1-3	Inexperienced 4	Inexperienced 5-7
Amos Tuck	Research Opportunities	.01	36	47	16	22	45	32
Boston College	Research Opportunities	.01	35	44	22	10	31	58
	Social Opportunities	.05	52	39	8	32	39	28
	Opportunity for Specialization	.01	35	40	26	7	36	57
	Prestige	.05	15	24	60	19	30	50
	Practical Experience Available	.01	27	43	30	3	29	68
	Cost and Financial Aid	.01	36	41	24	24	33	42
	Campus Environment and Facilities	.05	20	29	50	3	13	83
	Type of Student Attending	.05	18	37	46	21	38	41
	Community Involvement	.05	30	50	19	3	53	44
Sloan	Practical Experience Available	.05	24	39	37	16	36	48
Southern Methodist	Social Opportunities	.01	41	49	12	26	28	47
	Size of School	.01	35	42	25	15	28	57
	Practical Experience Available	.05	24	46	28	28	35	47
	Location	.05	1	3	94	4	4	92
	Campus Environment and Facilities	.05	24	41	36	14	26	61
	Breadth of Program	.05	15	31	52	15	20	64
Stanford	None	--						

of admissions procedures at all graduate schools studied. However, the traditional sacrosanct status of admission deliberations exacerbated by current sensitivity to "outside pressures" precluded a detailed examination of admission procedures at all but our own institution, the M.I.T. Sloan School of Management.

In undertaking this self-analytic introspection, our objective was to understand the strengths and weaknesses of our approach to this key decision process so that we might improve our future effectiveness. Off the record discussions with those engaged in these activities at other institutions as well as the data to be discussed in Chapter 8 lead us to believe that our experiences are neither novel nor extreme.

The most fundamental administrative problem facing the manager responsible for the admissions process is determination of the number and distribution of applicants who accept the offer of admission in order to achieve a desired entering class size and composition. At M.I.T. the goal was a heterogeneous entering class of 100 students. Historic acceptance rates were scrutinized to establish ratios for use in the current year. Sometimes the results were spectacular. Everyone remembers 1970 when 249 out of 797 applicants were accepted and exactly 100 students registered for classes. In contrast, all but the resident masochist try to forget the scheduling problems created in 1969 when acceptance of 292 out of 687 applicants yielded 128 first year graduate students -- a thirty percent error rate.

Applications for the fall term are due in January of the year. Most applications are evaluated during February and March and the majority of acceptance letters are mailed by the end of March. The number of letters sent is based on historic acceptance ratios.

Initial responses are analyzed in May if fewer accepted applicants than expected are confirming that they will attend in the fall. Additional letters of acceptance are sent to additional applicants evaluated in February and March and to late applicants who have received high ratings in subsequent

evaluations.

A Decade of Admission Procedures

During the last decade admission procedures at the Sloan School have changed gradually from year to year. On first exposure one might conclude that the system is oscillating from quantitative to qualitative assessment in ten-year cycles. Detailed observation reveals a more complex pattern.

In 1960, almost 280 applications were submitted to the Sloan School. Acceptance letters were sent to around 180, and 72 first year masters candidates attended classes in September 1960. The admissions procedure that year emphasized predicted cumulative grade point or "cum" based on a regression procedure developed and validated in 1956. In that year faculty members of the Master's Program Committee evaluated applications using interviews, data from the application, committee discussions and subjective judgements. The predicted cum and Committee assessments were found to produce comparable results in most instances and the predictive model was adopted.

The predicted cum was based on two inputs. The first was a normalized cumulative grade point scaled from 5.0 for 'A', through 2.0 for 'C', to 0.0 for 'F-Failing.' The second was the Admissions Test for Graduate Study in Business, abbreviated ATGSB, designed and administered by the Educational Testing Service of Princeton, New Jersey. The results of this examination are presented in three numerical ratings: total, verbal and quantitative. The total score is normalized to a mean of 500 and standard deviation of 100. The minimum total score is therefore 200, and the maximum 800. The verbal and quantitative scores have means of 30, standard deviations of 8, and ranges of 0 to 60. (Two-thirds of the population taking the test receive scores between 22 and 38).

In 1961 the predicted cum was calculated by adding the normalized undergraduate cumulative average multiplied by 0.143 to the ATGSB total score multiplied by 0.0015 and to a constant of 2.87. Applicants generating a predicted cum above

4.30 were automatically accepted. All other applications were read by at least one faculty member who could accept or reject the candidate or hold the application for committee review.

By 1962 the Master's Program Committee"had lost confidence in the (predicted cum) system." They were uncomfortable with a procedure based on an applicant's undergraduate performance and aptitude test score. "Personal evaluations" were deemed superior to the relatively automatic decision-rule-based assessment.

One professor assumed most of the application reading task in 1962. He reports spending 10 to 15 minutes on the normal application and states that before reading an application, he performed a "screening" function based on (guess what?) - "the 'cum' and ATGSB test scores." "Some of the applications were quick decisions."

After the initial screening, he read the letters of recommendation briefly for "clues" directing his attention to the transcript or other parts of the application. Then the transcript was examined with particular sensitivity to "grade trends", and the ATGSB test score was "evaluated mentally." If questions still remained, the letters of recommendation were reread. If still in doubt, the professor referred the application to another faculty member for a second reading.

By 1964 others "were doing much of the initial reading as well as more of the final reading." After reading the majority of the applications for two years, "... the load became too great as the number of applications increased."

In 1965, 494 applications were received and all members of the Master's Program Committee were asked to evaluate applicants. Each application was read by two members of the Committee. Evaluations were recorded using a four level rating system.

A - Outstanding - should be admitted
B - Strong candidate - should be left in consideration
C - Serious reservations about him
D - Not admissible

Each application, along with the transcript, letters of recommendation, and correspondence with the applicant, was placed in an envelope for circulation to the readers. The applicant's name, school(s) attended, degree(s), marital status, age, nationality (if not American), cumulative undergraduate grade point average and "cum adjustment factor" were listed on the front of the envelope.

The "cum adjustment factor" is based on the average ATGSB scores of students attending particular schools. The factor is intended to equalize cumulative ratings among schools by taking account of the competition and standards faced by a student attending a given school. The hypothesis is that a student attending a lower ATGSB school should have a higher cumulative grade point than an equally capable student attending a school with a higher average ATGSB score. When computing this factor, schools whose students previously obtained mean total scores from 496 to 504 are considered to be "average" and their "cums" are not adjusted -- their adjustment factor is 0. Cums from schools with mean scores of 545 or greater are given an adjustment factor of +0.5, and those from schools averaging less than 456 are adjusted by -0.5.

In 1966 readers were given an additional measure along with the packet of applicant materials. Data from the 1965 applicant population were used to establish deciles for the ATGSB total score and adjusted cumulative grade point. The decile ranking of each applicant's scores on these two scales were combined to produce an aggregate rating between 0 and 20.

Candidates admitted in 1966 had a median ATGSB score of 647 and a median adjusted grade point of 3.9. When applicant statistics for 1966 were compiled the distribution summarized in Table 7.10, page 7-23, emerged. Analysis of admission statistics revealed that those reading applications in 1966 had "... refused very few whose combined decile totaled 11 or above and ... accepted very few with deciles totaling eight and below."[1] With this discovery a new admissions

[1]March 1967 memorandum from the Program Administrator to members of the Masters Program Committee.

Table 7.10

1966 Decile Ranges for Applicant ATGSB Total Score
and Adjusted Cumulative Grade Point

Rank Score	ATGSB Score	Adjusted "Cum"
10	701-768	4.8 and above
9	670-700	4.6 - 4.7
8	648-669	4.3 - 4.5
7	624-647	4.2
6	605-623	4.1
5	581-604	4.0
4	556-580	3.9
3	526-555	3.7 - 3.8
2	482-525	3.5 - 3.6
1	297-481	3.4 and below

criterion was born.

While the decile rank provided the basic "screen" for the new admissions procedure, those reading applications in 1967 were asked to consider five additional factors in arriving at a final evaluation. The application form was modified to include a 'statement of plan' as an additional input to these deliberations. The five factors specified for the readers were:

- Trends in grades, or distribution of grades
- Strength of recommendations
- Activity or experience record
- Evidence of motivation (perhaps the statement of of plans - new this year - will help)
- Preparation in mathematics (should meet requirements of at least a year of college math, including calculus). [1]

With the addition of these "dimensions of evaluation" the old four-point rating scale was deemed inadequate and plus and minus signs were added to the "A" through "D" scale to create a twelve-point rating system.

In 1968 the decile rankings that had been used for two years were replaced by quartiles. The Master's Program Committee "... felt that 20 slots constituted too detailed a grading system. Readers could not easily distinguish differences between candidates in the tenth and eleventh rankings, for example." Table 7.11, page 7-25, summarizes the quartile distribution of 1968 applicants.

In 1969 the Sloan School received 687 applications for the Master's Program. Despite this large volume, reasonably efficient processing was achieved through the use of a relatively simple admissions procedure. Applicants receiving an "A" rating on the first reading and an ATGSB score of 650 or better were accepted without a second reading. Similarly, applications with a "D" rating and an ATGSB score of less than 600 were rejected after the first reading.

Efficiency not withstanding, the winds of change were blowing across the Charles. A graduate student studying the admissions process during this period

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[1] Ibid.

Table 7.11

1968 Quartile Ranges for Applicant ATGSB Total Score and Adjusted Cumulative Grade Point

Rank Quartile	ATGSB Score	Adjusted "Cum"
Top	653-764	4.5 and above
Second	600-651	4.1 - 4.4
Third	543-598	3.7 - 4.0
Fourth	323-542	3.6 and below

described the situation as follows.

> The feeling had been growing in the Master's Program Committee that the test scores and the cum had become too dominant. Members of the Committee felt heavily biased against any applicant with low scores or a low cum. The two numerical values were superseding motivation, background, and other non-numerical factors which should have been considered. Applications seemed to be evaluated by some readers no further than the front of the envelope: a very high cum and a high ATGSB score meant acceptance, and low values meant immediate rejection. Numbers had begun to overpower judgement. [1]

One result of this "feeling" was the initiation of a test to determine the effect of the quantitative ATGSB and Adjusted Cum data on reader assessment. Those concerned that these factors might be having undue influence feared that high quartile position produced high ratings while low quartile scores resulted in rejection. To test this hypothesis, faculty members reading late applications in May 1969 were not given the ATGSB data. It was of course impossible to perform a matched test since the same application could not be given to the same reader with and without the quantitative input. However, the general conclusion of the Masters Program Committee was that "readers looked at more diverse information when not given the ATGSB scores."[2] The nature of the "diverse information" or the way it was used were not of particular concern. It appeared that more time was spent on <u>each</u> application in the absence of a quantitative ranking; and a majority of the committee found comfort in the fact that readers could not be biased by a single number. As a result of this conclusion ATGSB test scores were not given to those reading applications in 1970.

Some members of the Masters Program Committee were troubled by two ancillary findings that emerged from the 1969 analysis. The first was the disparity between ratings assigned the same applicant by different faculty members. The second was

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[1] Monk, James A. Jr., <u>A Feasibility Study of a Proposed Admissions Program for the Alfred P. Sloan School of Management</u>, June, 1971, M.I.T., Cambridge, Mass. page 22.

[2] <u>Ibid</u>, page 23.

the blatant prejudice of some faculty members.

The ATGSB score had been a stabilizing influence. A faculty member would carefully consider the basis for his judgement before rejecting an applicant in the top 1% of the ATGSB distribution. In the absence of the ATGSB reference a faculty member could cavalierly reject an experienced applicant with a 710 (97 percentile) ATGSB score with the observation, "I have very little sympathy for the displaced Aeronautic Engineers."[1] The subjective orientation of faculty members looking for students fitting their group's image also became more important; for example, conflicting evaluations frequently generated by quantitative (statistics) and qualitative (organization studies) faculty members.

To compensate for potential faculty member bias all 1970 applications were read at least twice. In addition, the five bases for applicant assessment established in 1967 were expanded to 10 dimensions of evaluation. Readers were asked to rate each applicant on each dimension using a 4 point A-B-C-D grading scale. The 10 dimensions were:

1. Ability to Structure
2. Academic Performance
3. Experience
4. Interest in Management Role
5. Leadership
6. Math Background and Proficiency
7. Motivation
8. Native Ability
9. Seriousness of Intent
10. Commitment to Acquiring Technical Competence

Applicants who were strongly supported (or negated) by <u>both</u> readers were automatically accepted (or rejected). All others were evaluated in a group meeting with test scores available. Because of time pressures detailed group

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[1] Comment written on evaluation form by faculty reader in February 1970.

discussions of each candidate's qualifications were soon superceded by cursory assessments in which the test scores were the dominant consideration.

In addition to appraising the applicant on the ten dimensions, readers were asked to provide a composite "overall evaluation" using the A-B-C-D scale. Only the overall evaluation entered the admission procedures.

A similar procedure was followed in 1971. However, some applications received a single reading. Applicants with an ATGSB score above 650 who received an overall "A" rating from the first reader were automatically accepted In a similar fashion those with an ATGSB total score below 600 who were given a "D" rating by the first reader were rejected. All other applications were evaluated by two readers and screened by the cut-off rules specified in Table 7.12, page 7-29.

The combined single-reader and two-reader rules automatically accepted 133 and rejected 270 of the 777 applications received in 1971. Nearly half the applications (374) fell outside the automatic limits and were referred to the Master's Program Committee for further evaluation. After reviewing approximately 100 of these applications the Committee established revised ATGSB cut-off for the top four categories in Table 7.12. Application of these revised criteria completed the selection process.

Table 7.13 summarizes major aspects of the Sloan School admission process during the decade from 1960 to 1970. The most striking characteristic of this sequence is the circular path from automatic procedures in 1961 through completely subjective evaluation with no explicit criteria in the mid 60's to increasingly explicit criteria and automated screening in 1969 and 1970. The transition in 1962 from automatic acceptance of all applicants with cumulative grade points above 4.3 to subjective evaluation of all applicants by one faculty member is particularly noteworthy. So is the sudden elimination of ATGSB scores from the information supplied readers in 1970. See Table 7.13, page 7-30.

Table 7.12

1971 Two-Reader Admission Criteria

Reader Evaluation	ATGSB Score	Action
A/A	Greater than 550	Accept
A/B	Greater than 600	Accept
B/B	Greater than 650	Accept
C/B	Less than 550	Reject
C/C	Less than 600	Reject
D/C	Less than 650	Reject
D/D	---	Reject

Table 7.13

Summary of Sloan School Admissions Process 1960-1971

Year	Number of Students Applying	Accepted	Attending	Admission Process	Median Cum	Median ATGSB
1960	279	178	72	-Subjective combination of Mathematical "Predicted Cum", Interviews and Application Evaluation	*	*
1961	336	193	85	-Automatic acceptance based on "Predicted Cum" > 4.3. Others subjective evaluation by readers	*	*
1962	374	216	95	-Single reader subjective evaluation with non-specific "screening" based on ATGSB Score and Grade Point. Emphasis on Letters of Recommendation.	3.8	584
1963	373	*	98	-As in 1963	3.9	594
1964	400	*	88	-Other readers added to single reader. No specific policy enunciated. Subjective evaluation by each reader.	3.8	617
1965	507	223	108	-All applications read by two Masters Program Committee Members.[1] Four letter Grade Scoring System and Cum adjustment factor initiated	3.8	635
1966	568	234	102	-As in 1965 with addition of ATGSB and Grade Point decile ranks.	3.9	647
1967	576	*	106	-Decile rank screening, explicit criteria and expanded 12 point scoring system	4.0	600
1968	620	260	97	-Decile rank compressed to Quartiles	4.0	609
1969	687	292	128	-Automated acceptance and rejection of top and bottom groups respectively by ATGSB and Reader Evaluation	4.0	605
1970	797	250	101	-Automatic procedure continued for top and bottom groups, but, test scores kept from readers and used by review committee	4.0	625
1971	777	244	109	-Automatic acceptance process reduced to single reader on extreme scores. Evaluation dimensions expanded from 5 to 10.	4.2	588

[1] From 1965 on, all application reading was done by Master's Program Committee members.

* Information unavailable from admissions office.

In view of the effort devoted to establishing quantitative cutoffs based on ATGSB scores and cumulative grade points, it is surprising to note the hesitancy to establish explicit procedures or criteria for reader evaluation of other applicant data. Prior to 1967 the dimensions of reader evaluation were a matter of individual reader judgement. When the first five dimensions were suggested in 1967, no attempt was made to obtain reader assessment of applicants on specific dimensions. In 1971 when the ten dimensions were formulated and specific reader evaluation along each dimension was requested, many faculty members refused to provide these specific assessments. Their bases for acceptance or rejection were "private." "After all, you don't ask a physician to specify each stage in his analysis. You want his professional opinion, not a report of his diagnostic sequence. This is also a matter of professional judgement."[1] Later in this chapter we will examine the conclusions reached on the basis of data provided by faculty members who gave dimension-specific assessments.

The tendency to create, and then dismantle, elaborate rating structures also warrants comment. After abandoning the "predicted cum" computed to three decimal places the Committee introduced a "cum adjustment factor." The four letter grading system introduced in 1965 was soon expanded to a twelve-unit scale by appending '+' and '-' categories to each grade level. In fact some faculty readers insisted on using a twenty eight unit scale by assigning up to three plus or minus values (e.g., C^{+++} or B^{---}). The twenty-point decile ranking system established in 1967 was compressed to a quartile structure in

[1] Comment by faculty reader in 1971.

1968 and then abandoned in favor of direct analysis of its components.

Despite the precise mathematics and complex procedures employed throughout this period, it was 1971 before a group of faculty readers submitted to a detailed analysis of their evaluative process. The results of this research and subsequent sets of alternative "admission process models" are discussed in the next section.

A Model of Applicant Evaluation

Three managerial considerations provide strong motivation for modeling the admission process. First is the need to identify the dimensions that are (and should be) considered when evaluating applicants. The second is the issue of individual faculty member bias and the associated need to reduce or account for this lack of consistency. In this context it is frequently argued that selection by a diverse faculty with recognized differences insures a heterogeneous student body and guards against stifling narrowness. This contention does not alter the managerial need. If the objective is to select a heterogeneous sample we still need to insure that this goal is being achieved. The third administrative need is for efficiency in the use of faculty time and in the transfer of experience from one faculty group to another.[1]

Any attempt to model an essentially "judgemental" process is immediately subjected to the claim that generalized representation is impossible. "Each case is different." "The criteria depend on the applicant." Despite these contentions, sequential choices among apparently qualified applicants continue to produce a relatively constant entering class despite variations in the number of applicants. This fact suggests that, if nothing else, the cutoffs applied in each year must be relative and that, to at least this extent, applicants

[1] In 1971 faculty members reported spending an average of 16 minutes per application with a range from 5 to 45 minutes.

are being ranked (compared).

Available References -- The Inputs

Obviously the inputs to our model must come from the items available in the applicant packet given to the reader. These are: ATGSB score, undergraduate transcript, undergraduate activities, letters of recommendation, and "Plan for Graduate Study."

The ATGSB scores discussed earlier provide three related measures of student aptitude: a "Total Score" normalized to a mean of 500, and a standard deviation of 100 (the range is thus 200 to 800), a "Verbal Score" with mean of 30 and standard deviation of 8, a "Quantitative Score" exhibiting statistical properties similar to the verbal score.

The transcript informs the reader of the number and type of courses taken as well as the grade received. In addition to the transcript which identifies the school(s) attended, the reader has the "cum adjustment factor" reflecting the relative historic performance of students from that university on the ATGSB exams.

Since the applicant is the source of information regarding extra curricular activities the reader is totally dependent on the student for data in this area. At times letters of recommendation will corroborate intense involvement in one or more activities. But in most instances the reader must depend on the applicant's statement that he was, in fact Letterman in four sports, President of the debating club, Treasurer of his class, Concert master of the University Orchestra, and Editor of his school paper during a year when he started and ran two companies producing a combined gross of $400,000, served as state college chairman for a major political candidate, and was granted patents on a process for forming non-ferrous turbine blades.

Letters of recommendation are requested by each applicant and sent separately to the Admissions office. The "Reference Report" form asks the

person writing the recommendation to

> "Please give your frank opinion of the applicant. It will be useful to know how long and how well you have known him, and to what extent your attention has been drawn to such qualities as initiative, perseverance, intellectual powers, experimental skill, or resourcefulness. Do you know of any reason why he should not be admitted? Discrimination between his strong and weak points will help us materially, as will a comparison with other students who have entered M.I.T. from your institution."

Recommendations range from terse one-line comments to multi-page analyses. Those writing recommendations will sometimes indicate limited knowledge of the applicant; however, unfavorable letters are very rare. The reader must therefore attempt to read between the lines in letters of recommendation noting what was not said as well as what was. The problem is further complicated by differences in recommender personalities and standards. Faculty members at some institutions have applicants write their own letters of recommendation.

The "Statement of Plan" provides a forum for the applicant to discuss his qualifications while describing his plan for graduate study. The length, neatness, style and content range from hurriedly scribbled, "I plan to obtain a Masters Degree in Management from M.I.T. in order to advance my career objectives," to carefully prepared self analyses. Most applicants discuss their reasons for choosing a career in management, relevant experiences, proposed areas of concentration and career objectives. Some students use the space provided to explain or justify poor undergraduate performance, "...there was this girl from my home town and we had never really ...," or low test scores, "Contrary to my doctor's specific orders, with a temperature of 104° and under strong medication I attempted to ..."

Dimensions of Evaluation

The first and perhaps most significant problem facing the aspiring admission process model builder is to establish a limited set of dimensions that encompass the applicant characteristics considered by all types of readers.

This problem was faced by a subcommittee of the Masters Program Committee in the fall of 1970. Building on prior experience and a framework proposed by Professor Jack Rockart the group identified dimensions linked to the five types of inputs. The name given each dimension describes the trait it was designed to encompass: Native Ability, Mathematical Ability, Experience, Leadership, Motivation, Seriousness of Interest, and Commitment to Acquiring Technical Competence.

"Native Ability" is the term used to describe basic intelligence or scholastic aptitude. Assessment along this dimension involves four of the five inputs scaled to reflect Sloan School faculty biases. The ATGSB score was transformed to a -4 through +3 scale shifted to reflect a bias favoring applicants with scores in excess of 600 as indicated in Table 7.14, page 7-36.

Data from the applicant's transcript are structured to reflect three aspects of the academic record considered important by the faculty. These are: the absolute value of the adjusted cumulative grade point, the number of "F's" received, and the trend. The "adjusted cum" is scaled in a manner analogous to the ATGSB score as illustrated in Table 7.15. The resulting scale value is then decremented by 1 if the applicant has received between 1 and 3 "F's" and by 2 if more than 3 "F's". Grade trend is incorporated by incrementing the score by 1 if a positive trend is established and decrementing by 1 if a negative slope is perceived. See Table 7.15 page 7-37.

Letters of recommendation can provide both explicit and implicit assessment of the applicant's native ability. At the conclusion of each applicant reference report, the individual writing the letter of recommendation is asked to provide a comparative assessment using the categories outlined in Table 7.16, p.7-38. In instances where the writer fails to check the appropriate category, it is often possible to establish the proper classification on the basis of comments in the letter. The quantitative rating assigned an applicant is the average

Table 7.14

ATGSB Score Scaling for Admission Model

ATGSB Score	Scaled Value
Greater than 699	+3
650 - 699	+2
600 - 649	+1
550 - 599	0
500 - 549	-1
450 - 499	-2
400 - 449	-3
Less than 400	-4

Table 7.15

Adjusted Cumulative Grade Point Scoring for Admissions Model

Adjusted Cum	Scaled Value
4.65 - 5.00	+3.0
4.36 - 4.65	+2.0
4.16 - 4.35	+1.0
3.86 - 4.15	0
3.66 - 3.85	-1.0
3.36 - 3.65	-2.0
Less than 3.36	-3.0

Table 7.16

Admissions Model Scoring of Letter of Recommendation

Assessment	Scaled Value
Equal to the best in any department	+3
Will perform at a superior level wherever he continues his studies	+1
His performance should be up to the average of most graduate students	-1
Qualifications marginal, but he deserves to go on to further study.	-2
Questionable whether he merits admission to further study	-3
Not able to judge	0

scaled value from all letters received.

The fourth and most ambiguous input to the assessment of native ability is the written statement. The ambiguity derives from the difficulty of attributing the final product to native ability as opposed to care in preparation, personal pride, or the articulateness of the applicant's girl (or boy) friend.

While some faculty members argue that neatness is more appropriately viewed as an indication of seriousness of interest than intelligence, the majority of those concerned with this process reason that "an applicant should be intelligent enough to do a neat job on his application." In final analysis the written statement enters this dimension only as a negative factor. Applicants are penalized by either one or two points for excessive verbosity, poor grammar, misspellings, and other "first draft" qualities. Unusual elegance is not rewarded on this dimension.

Mathematical ability is related to two of the five inputs. The first is the ATGSB Mathematics score (as opposed to the total score used to assess native ability). The second is the applicant's academic performance in mathematical courses. The raw math score is normally distributed around 30 and the scaling indicated in Table 7.17 reflects the Sloan School faculty's bias toward applicants scoring above the 75th percentile level. See Table 7.17, p.7-4

The applicant's prior exposure and performance in mathematically oriented courses is assessed by counting the number of such courses on the transcript in which he received a grade of C or better. On the assumption that an applicant with normal mathematical orientation would have taken at least five undergraduate courses with math content, the cumulative course count derived from Table 7.17 is decrimented by five to obtain a scale value ranging from -5 where the applicant has not received a C or better in any mathematical course, through a possible upper limit of +3 or +5 for the individual who has successfully completed eight or ten such courses.

Table 7.17

ATGSB Mathematical Score Scaled for Admissions Model

ATGSB Math Score	Scaled Value
Greater than 44	+2
40 - 44	+1
33 - 39	0
30 - 32	-1
Less than 30	-2

Experience can be established from three of the inputs. However, the members of the faculty committee differ in their assessment of the importance appropriately attached to this factor. Some place substantial emphasis on experience believing it provides perspectives which increase the relevance of classroom activities and should be viewed as an indication of the applicant's capacity to apply that which he learns in graduate school. Others believe the basic qualities represented by the remaining six dimensions should far outweigh experience.

The scaling system illustrated in Table 7.18 reflects the value judgment of those who place positive emphasis on non-academic experience. Certain perceptions reflected in this table deserve special comment. Faculty members evaluating extracurricular activities questioned the appropriateness of a +2 rating for applicants with more than ten years of non-academic experience. "There should be a cutoff point for a masters program. Beyond that point ... (the applicants)... should try an executive development program." Letters of recommendation were examined for indications that the applicant had either made significant contributions or gained substantially in knowledge, attitude, or skill as a result of non-academic experiences. In a similar sense, high value was placed on evidence in the applicant's plan that he had been able to relate non-academic experiences to career objectives. The applicant with significant experience who failed to integrate it into his plan was down-graded for this omission. See Table 7.18, page 7-42.

The scale values indicated in the third column of Table 7.18 are combined to obtain a final "score." That is to say, the value contributed by extracurricular activities is added to that associated with letters of recommendation and statement of plan. The maximum achievable experience scale value is therefore +5 and the minimum -3.

Table 7.18

Experience Scales for Admissions Model

Source	Evaluation	Scale Value
Extracurricular Activities	2 to 10 years Non Academic Experience	+2
Extracurricular Activities	1 to 2 years Non Academic Experience	+1
Extracurricular Activities	More than 10 years Non Academic Experience	0
Extracurricular Activities	Less than 1 year Non Academic Experience	-1
Letters of Recommendation	"Significant Contribution or Learning"	+1
Letters of Recommendation	No Mention	0
Letters of Recommendation	Negative Performance	-1
Statement of Plan	Experience Related to Plan	+2
Statement of Plan	Experience Referenced	+1
Statement of Plan	No Experience	0
Statement of Plan	Experience But No Mention in Plan	-1

Leadership potential is assessed on the basis of the same three input sources used to evaluate experience. The scaling structure applied in this context is summarized in Table 7.19, page 7-44.

Determination of "leadership roles" involves a high degree of subjectivity. For example, the majority of faculty members do not believe that participation in musical or sport activities shows leadership potential. Those skeptical of this judgment reasoned that participation per se should be viewed positively and considered their colleagues criteria too restrictive. "How many quarterbacks can you have on one team?"

The phrases noted in Table 7.19 in connection with letters of recommendation are indicative of the content sought by readers. While the majority agreed with the structure presented in this table, some members of the committee questioned the negative assessment assigned applicants who had tried and failed as a leader. In their opinion a valid analysis requires that the reader ask, "Did he learn from his experience?" Issues such as this cause faculty members to become frustrated with attempts to make valuative parameters explicit. Explication leads to disagreement. In the absence of explication individual faculty members continue to use totally conflicting subjective criteria. However, since no one is aware of the judgments being imposed by their fellow readers, there is no overt disagreement. "Ignorance is bliss."

In evaluating applicant plans for graduate study, readers are looking for indications of "entrepreneurial orientation" and/or "action oriented" objectives as indications of leadership potential. Suggestions of academic leaning with interest in teaching or research are viewed negatively in the leadership context unless the applicant specifies research or academic management as a career objective.

The scale values in the third column of Table 7.19 should be viewed cumulatively in a manner analogous to that already discussed for the entries in Table 7.18.

Table 7.19

Leadership Scale Values for Admissions Model

Source	Evaluation	Scale Value
Extracurricular Activities	Leadership Role in 2 or more activities	+2
Extracurricular Activities	Leadership Role in 1 or active in 3	+1
Extracurricular Activities	No Leadership Role but active in 1	0
Extracurricular Activities	No Significant Extra Curricular Activity	-1
Letters of Recommendation	"Strong Evidence of Leadership Skill"	+2
Letters of Recommendation	"Capacity for... or worked well with others"	+1
Letters of Recommendation	No Applicable Comment	0
Letters of Recommendation	"Shy", "Did not mix well"	-1
Letters of Recommendation	"Failed as a Leader", "A Follower"	-2
Statement of Plan	Clear Objectives - Entrepreneurial	+2
Statement of Plan	Goal Oriented	+1
Statement of Plan	No Mention	0
Statement of Plan	Desire to Work Alone, Academic Orientation	-1
Statement of Plan	Confused, Indecisive	-2

"Motivation" is among the most elusive dimensions with which the committee was forced to cope. Indications of apparent motivation can be found in four of the five inputs. However, structuring, evaluating and scaling information from these sources involves a high level of judgment (and at times imagination).

Table 7.20 describes the scaling procedures applied to data from the academic transcript, letters of recommendation, and plan for graduate study. Participation in a broad range of extracurricular activities or specific evidence of commitment to self improvement results in a one point increment to the cumulative scale value established by the first three sources. The absence of significant activities results in a one point decrement from the cumulative value. Significant publications are also considered to indicate strong motivation. See Table 7.20 page 7-46.

Criteria specified in the academic transcript section of Table 7.20 reflect the faculty's perception that the student with a low scholastic aptitude (revealed by the ATGSB) and a relatively high academic performance (measured by his adjusted cumulative grade point) is motivated while his colleague with a high aptitude and low performance record is not.

Letters of recommendation are examined for references to "strong motivation", "persistence" or negative comments suggesting lack of motivation.

Evaluation of the plan for graduate study (Statement of Plan) in search of motivation indicators is a particularly striking case of quantitative representation of subjective judgments. In view of the obvious problems it is encouraging to note that the vast majority of faculty members agreed on the use of the extreme (+2 or -2) points in this scale -- they assigned them to the same students. This consistency did not, however, extend to discrimination between 0 and +1 or 0 and -1. The term "Normal goals" in Table 7.20 includes "to become a manager", "to achieve a line management position." "Good motivation" is normally attributed to those with more specific objectives, for

Table 7.20

Motivation Scale Values for Admissions Model

Source	Evaluation	Scale Value
Academic Transcript	ATGSB $\geq$ 700 and Cumulative Grade Point < 4.0	-1
	ATGSB $\geq$ 600-699 and Cumulative Grade Point < 3.5	-1
	ATGSB $\geq$ 500-599 and Cumulative Grade Point < 4.0	+1
	ATGSB $\geq$ 400-499 and Cumulative Grade Point < 3.5	+1
Letters of Recommendation	"Strongly Motivated"	+2
	"Motivated" or "Persistent"	+1
	No Mention	0
	Inconsistent or Negative comments	-1
	"Lacks Motivation"	-2
Statement of Plan	Very Strong Motivation, Decisive Goals	+2
	Good Motivation, Clear Career Plan	+1
	Normal Goals	0
	Weak Motivation	-1
	Very Poor Motivation, Unsure or Unclear Goals	-2

example, "to become Vice President of Marketing for a consumer product company." "Very strong motivation" is most frequently attributed to the individual with clearly established, personally oriented objectives. For example, "Our family business has been deteriorating for the last five years. In my opinion our problem is marketing. After graduation from the Sloan School I hope to take responsibility for this area. My proposed program reflects this goal. Specifically ..."

Scale values specified in the third column of Table 7.20 are combined cumulatively to obtain a maximum score of +5 and a minimum score of -5.

"Seriousness of intent" can only be assessed subjectively by evaluating the content of letters of recommendation and the applicant's plan for graduate study. Table 7.21 summarizes the scale values applied to data from these two sources to develop measures along this dimension. See Table 7.21 page 7-48.

Letters of recommendation frequently comment on unusually mature applicants. Such phrases as "serious", "level headed", "well adjusted", and "unusually mature" are found in the letters for some applicants. In other instances, the reader is alerted by remarks such as, "I would expect his performance to improve with maturity."

When evaluating the plan for graduate study with respect to seriousness of intent, the reader is looking for a clear, well formulated program with specific goals. The assumption is that the student who is serious about graduate study will have developed a reasonably well organized career program and taken the time to communicate it effectively. In contrast the applicant who offers a rambling or ambiguous series of free associations is given a negative rating. Readers have become alert to the applicant who has serious misconceptions about the Sloan School. For example, "I am particularly anxious to attend a graduate school that emphasizes the case method since I believe this approach will maximize my exposure to relevant business situations." (The Sloan

Table 7.21

Scale Values for Seriousness of Intent Dimension

Source	Evaluation	Scale Value
Letters of Recommendation	"Well Thought Out Plans" - "Unusual Maturity"	+2
	"Mature", "Serious"	+1
	Normal - No Particular Mention	0
	"Lacks Direction", "Changes Plans Frequently"	-1
	Concensus indicates immaturity	-2
Statement of Plan	Clear, Well Formulated Goals and Program	+2
	Organized Statement with Purpose	+1
	Acceptable Plan	0
	Unclear, Rambling, Lacking Goal	-1
	Erroneous Impression of Sloan School or Confused Plan	-2

School uses very few case studies).

"Commitment to acquire technical competence" is evaluated against data from the applicant's transcript, letters of recommendation, and statement of plan. Interest in this dimension emphasizing the student's commitment to an analytic, systems oriented approach to management reflects the Sloan School's concern that entering students share the faculty's fervor for organized problem definition and solution. Recognizing that this dimension may well be unique to the Sloan School, it is important to remember the purpose of this analysis. Namely, to determine within a specific environment whether it is possible to structure and quantitatively describe the admissions process.

The implications of the number of technical courses taken previously vary dramatically depending on the applicant's undergraduate field of study. Faculty members at the Sloan School believe that a relatively small number of technically oriented courses may indicate a liberal arts major's commitment while an engineer who would be expected to receive high marks for mathematical ability should not be given additional credit for unusual commitment to acquisition of technical competence unless he has taken a relatively large number of technical courses. The quantitative representation of these judgements is detailed in Table 7.22 page 7-50.

Both letters of recommendation and plan of study may offer clues to the applicant's technical orientation. Those supplying references may comment on his "keen analytic mind" or "capacity for analytic thinking." On the other hand, they may note that he has "little interest in detail" or "does not like to be bothered with technical issues". In a similar manner specific references in the plan of study to the value of technical skills or a commitment to a particular style of management yield plus ratings while the applicant espousing "management by intuition" is apt to be downgraded on this dimension.

While agreeing that both the plan and recommendations can contribute to the ultimate scale value on this dimension, those involved in the Master's Program

Table 7.22

Scale Values for "Academic Performance"
Contribution to Commitment to Acquiring Technical Skills

Undergraduate Field	Number of Technical Courses	Scale Value
Liberal Arts and Math	≥ 4	+2
	2 - 3	+1
	0 - 1	0
Business and Economics	≥ 6	+2
	4 - 5	+1
	≤ 3	0
Engineering and Science	≥ 16	+2
	13 - 15	+1
	10 - 12	0
	≤ 9	-1
Four or More Courses in One Foreign Language		+1

Committee subgroup placed the greatest emphasis on data derived from the letters of recommendation. As a result, a -2 to +2 range was established for assessment based on these data while evaluations of the statement of plan were limited to ratings from -1 to +1.

Relationships among the five inputs and seven dimensions discussed thus far in this section are summarized in Table 7.23 pages 7-52 to p. 7-55.

Process Validation

Our first hurdle in developing a formalized representation of the admissions process was to establish a limited set of dimensions encompassing applicant characteristics considered relevant by those who read applications. Once this goal was achieved, we had a framework for analysis. The issue then becomes whether this framework enables us to predict or explain the decisions of those responsible for the graduate admissions process at the Sloan School of Management.

This process validation question was posed in the previously footnoted Master's thesis prepared by James Monk of the Sloan School of Management in 1971.[1] His analysis focused on 155 applications for the class entering in 1970 and 99 applicants for the class entering in the fall of 1971. Statistical comparisons between these sample populations and all applicants indicate that the sample is totally representative of the larger group.

The first portion of this validation analysis will focus on ten of the 21 scale elements summarized in Table 7.23 involving objective criteria which can be tested without obtaining subjective inputs from the reader. The question to be answered when examining these scale factors is: Are the values of accepted students significantly different from those of rejected applicants? Mr. Monk chose to approach this question with a chi-square analysis testing the null hypothesis that the accepted and rejected samples were both drawn from the same population.

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[1] Those interested in a detailed exposition of the material summarized in this chapter are referred to Chapter 3 of Mr. Monk's thesis, "Data Analysis", pp. 72-111.

Table 7.23 Summary of Admission Process Input/Evaluative Dimension Linkages

Dimensions of Evaluation	Inputs: ATGSB Test Results	Academic Performance	Extracurricular Activities	Letters of Recommendation	Written Statement	Total Score
Native Ability	≥700 +3 650-699 +2 600-649 +1 550-599 0 500-549 -1 450-499 -2 400-449 -3 ≤399 -4 (-4 to +3)	ADJ CUM — Score 4.65-5.00 +3 4.36-4.64 +2 4.16-4.35 +1 3.86-4.15 0 3.66-3.85 -1 3.36-3.65 -2 ≤3.35 -3 #of F's — Score 0 0 1-2 -1 ≥3 -2 Positive Trend +1 Negative Trend -1 (-6 to +4)		Equal to best in any department...+3 Will perform at superior level wherever continues his studies.....+1 Performance should be up to average of most graduate students.....-1 Qualifications marginal, but he deserves to go on to further studies.....-2 Questionable whether merits admission to further study....-3 Not able to judge.0 (-3 to +3)	Well typed (Errors corrected, well thought out, good grammar, Normal.....0 Excessive verbosity, poor grammar.-1 misspelling, not neat, "First draft" quality.....-2 (0 to -2)	(-11 to +10)
Mathematical Ability	Math Score — Score ≥45 +2 40-44 +1 33-39 0 30-32 -1 ≤29 -2 (-2 to +2)	Number of Math Courses with grade of "C" or better, less 5. (-5 to +5)				(-7 to +7)

Table 7.23 Continued

Dimensions of Evaluation	Inputs: ATGSB Test Results	Academic Performance	Extracurricular Activities	Letters O Recommendat on	Written Statement	Total Score
Experience			≥ 2 years....+2 < 2 years....+1 >10 years.....0 < 1 year.....-1 (-1 to +2)	"Learned from Work", or "Contributed Significantly"....+1 No mention of experience.....0 Negative comments about experience..-1 (-1 to +1)	Experience linked to plans.....+2 Experience mentioned...+1 No experience.....0 Not mentioned but shown elsewhere...-1 (-1 to +2)	(-3 to +5)
Leadership			≥ 2 activities as leader.....+2 1 activity as a leader or ≥3 activities.....+1 1 activity, no leader.....0 No significant activities.....-1 (-2 to +2)	"Leadership unquestionable"....+2 "Considerable capacity for leadership" or "Worked well with others".....+1 No mention.....0 "shy" or "did not mix well"....-1 "Failed as a leader" or "Follower".....-2 (-2 to +2)	"Strong entrepreneurial orientation"+2 Leadership as objective...+1 No mention...0 Wants to teach, do research, (unless wants to lead them) .....-1 Confused, indecisive..-2 (-2 to +2)	(-6 to +6)

Table 7.23 Continued

Dimensions of Evaluation	Inputs: ATGSB Test Results	Academic Performance	Extracurricular Activities	Letters of Recommendation	Written Statement	Total Score
Motivation		ATGSB Score / CUM / Score ≥ 700 below 4.0 -1 600-699 below 3.5 -1 500-599 above 4.0 +1 400-499 above 3.5 +1 (-1 to +1)	Broad range of activities...+1 Emphasis on self improvement.....+1 Normal.....0 "Publications"+1 No activities -1 (-1 to +2)	"Strongly motivated.....+2 "Motivated" or "Persistent".....+1 No mention, normal.....0 Inconsistent or negative indications.....-1 Majority says "Lacks Drive".....-2 (-2 to +2)	Very strong motivation, decisive goals.....+2 Good motivation.....+1 Normal goals.....0 Weak.....-1 Very poor motivation, unsure, unclear.....-2 (-2 to +2)	(-6 to +7)
Seriousness of Intent				"Well thought out plans" or "Reasonably Mature".....-2 "Mature, Serious"-1 Normal.....0 "Changed plans frequently" or "lacks direction"-1 Majority indicates immaturity.....-2 (-2 to +2)	Clear, well-formulated goals.....+2 Organized statement of purpose.....+1 Acceptable plan.....0 Unclear, not to point....-1 Erroneous impressions, ambiguous...-2 (-2 to +2)	(-4 to +4)

Table 7.23 Continued

Dimensions of Evaluation	Inputs: ATGSB Test Results	Academic Performance	Extracurricular Activities	Letters of Recommendation	Written Statement	Total Score
Commitment to Acquiring Technical Competence		Field / #of Tech. Courses / Score Liberal Arts & Math: ≥4 +2; 2 - 3 +1; 0 - 1 0 Business & Economics: ≥6 +2; 4 - 5 +1; ≤3 0 Engineering & Science: ≥16 +2; 13-15 +1; 10-12 0; ≤9 -1 Four or more courses in one foreign language +1 (-1 to +3)		"Keen Analytical Mind".....+2 "Competent in field" or "Interested in Scientific Method" or "Capacity for Analytic Thinking".....+1 No mention, normal.....0 "No interest in detail" or "Not academically inclined".....-1 "Not interested in scientific techniques".....-2 (-2 to +2)	Mentions technical skills needed or analytic management style or "Human" management.....+1 Normal, no mention.....0 Negative comments.....-1 (-1 to +1)	(-4 to +6)

The ATGSB total score has been inextricably intertwined in the Sloan School admissions process during the 11 year period encompassed by our discussion. Since it has been the basis for preliminary screening and partially automated selection for several years, we would expect the ATGSB scores of those accepted by Sloan to differ dramatically from those rejected.

The ATGSB scores for the 254 applicants in the combined 1970 and 1971 sample are displayed in Table 7.24 Chi-square analysis of the two distributions confirms what a quick glance suggests, - the ATGSB score distribution of accepted and rejected applicants are very different. The significance level on this test is .001 indicates that there is less than 1 chance in 1,000 that such different distributions would be randomly drawn from the same population. See Table 7.24, p. 7-57

The ATGSB quantitative score enters our analysis as a primary measure of applicant mathematical ability. Since this figure does not enter current admission procedures directly, we might not have the same a priori confidence in its significance that was associated with the total score. Two considerations, however, would cause us to suspect that this measure might be an effective discriminator. First, we know the quantitative score is highly correlated with, and in fact a component in, the total score. Second, we would expect the M.I.T. faculty's sensitivity to mathematical aptitudes to produce definite discrimination against those with low performance in courses covering material of the type tested by the ATGSB quantitative measure.

Table 7.25 summarizes the data for accepted and rejected candidates on this dimension. Once again the distribution for the two populations is significantly different at the .001 level. See Table 7.25 page 7-58.

The undergraduate cumulative grade point (the "cum") is the overall indicator of academic performance. As such we would expect it to reflect faculty emphasis on academic aptitude as revealed in the undergraduate transcript. Table 7.26, page 7-59, details the raw cumulative grade point score ranges for accepted and rejected applicants. While the distributions for the two groups are clearly different,

Table 7.24

ATGSB Total Score Ranges For Accepted and Rejected Applicants

Range	Accepted Number	Accepted %	Rejected Number	Rejected %	% of Range Accepted	% of Range Rejected
≥ 700	14	12	2	1	88	12
650-699	38	33	17	12	69	31
600-649	39	34	16	12	71	29
550-599	12	10	42	30	22	78
500-549	6	5	26	19	19	81
450-499	2	2	16	12	11	89
400-449	3	3	10	7	23	77
≤ 399	2	2	9	6	18	82
	116	100	138	100		

Table 7.25

ATGSB Quantitative Score Ranges For Accepted and Rejected Applicants

Range	Accepted		Rejected		% of Range	
	Number	%	Number	%	Accepted	Rejected
≥ 45	30	26	9	7	77	23
40-44	38	33	25	18	60	40
33-39	36	31	52	38	40	60
30-32	7	6	23	16	23	77
≤29	5	4	29	21	15	85
	116	100	138	100		

Table 7.26

Raw "Cum" Score Ranges For Accepted and Rejected Applicants

Range	Accepted		Rejected		% of Range	
	Number	%	Number	%	Accepted	Rejected
4.6-5.0	11	10	9	6	55	45
4.3-4.5	31	26	16	12	66	34
3.8-4.2	49	42	53	38	48	52
3.6-3.7	9	8	17	12	35	65
3.3-3.5	8	7	16	12	33	67
≤3.2	8	7	27	20	23	77
	116	100	138	100		

chi-square analysis reveals that this measure does not discriminate with quite the same significance as the ATGSB data. Specifically, the significance level for Table 7.26 is .005 rather than the .001 level realized with both ATGSB score distributions.

You may recall that the raw undergraduate cumulative grade point has not been used in the Sloan School admission process since 1965 when the "cum adjustment factor" was initiated. Table 7.27 page 7-61 demonstrates what happens when the adjustment is added to the raw scores. The percentages of the upper range accepted and the lower range rejected both increase markedly. In fact, these distributions begin to look like our earlier ATGSB results. Chi-square analysis confirms that this is the case. Once again, we have significance at the .001 level.

At this point it may be appropriate to mention a small but significant operating detail. The envelope containing applicant material is marked with the raw cum and the cum adjustment factor (i.e., +0.5 or -0.5) rather than with the adjusted cum. The reader is therefore given a quick and direct indication of the "quality" (the cum adjustment factor) of the school from which the applicant comes.

We might hypothesize that faculty readers show preferences from schools with + as opposed to - adjustment factors. Returning to the data, a comparison of applications with a +0.5 cum adjustment factor against those having 0 or -0.5 adjustments verifies our suspicion. The odds are 1.4 to 1 in favor of acceptance for the applicant from a school with "positive" cum adjustment factor and 2.4 to 1 for applicants from +.5 schools (4.6 to 1 if M.I.T. undergrads are excluded from the sample.) In contrast the odds are 3.3 to 1 against applicants from schools with 0 or negative adjustment factors.

The number of courses failed has also been suggested as an indicator of academic prowess. Table 7.28 p. 7-62 containing the data for the proposed range value shows that this measure has limited practical value. While it is true that the largest percentage of those accepted had not failed any course, the same observation applies

Table 7.27

Adjusted "Cum" Score Ranges For Accepted and Rejected Applicants

Range	Accepted		Rejected		% of Range	
	Number	%	Number	%	Accepted	Rejected
4.6-5.0	46	40	17	12	73	27
4.3-4.5	29	25	17	12	63	37
3.8-4.2	26	22	44	32	37	63
3.6-3.7	8	7	12	9	40	60
3.3-3.5	4	3	26	19	13	87
$\leq$ 3.2	3	3	22	16	12	88
	116	100	138	100		

Table 7.28

Number of Courses Failed by Accepted and Rejected Applicants

Range	Accepted		Rejected		% of Range	
	Number	%	Number	%	Accepted	Rejected
0	98	85	92	67	52	48
1-3	14	12	29	20	33	67
≥ 4	4	3	17	13	19	81
	116	100	138	100		

to those rejected. In a similar manner while 81% of those failing four or more courses were rejected so were nearly 50% of those with no "F's" on their record.

Number of math courses taken was proposed as a measure of mathematical ability. Given the Sloan School's quantitative orientation we might expect faculty readers to favor individuals who have taken proportionately large numbers of math courses. The data displayed in Table 7.29 do not support this assumption. It is true that none of the applicants with no math courses on their record were accepted. However, a large portion of those in the highest category also failed to gain admission. Once again, chi-square analysis confirms our intuitive feel. There is a 27% chance that the realized distributions could have been obtained by random selection from the same population - in short, no significant discrimination. See Table 7.29, page 7-64.

One explanation for this result might be that the M.I.T. undergraduates and math majors among the group are biasing the results. In fact, math majors averaged 11 math courses while the average M.I.T. applicant completed slightly less than four. There is clearly no simple relationship between this measure and acceptance or rejection. At a later point in this chapter we will examine the results obtained whe a threshold requirement involving a minimum cutoff is imposed on these data.

The motivation measure based on the ATGSB total score and adjusted cumulative grade point was applicable to 72 of the 254 applications studied. You will recall that the concept behind this measure was that more favorable ratings should be given to applicants whose actual performance exceeded their apparent aptitude manifest by the ATGSB, while applicants whose adjusted cum failed to measure up to their apparent aptitude should be regarded more skeptically.

Table 7.30 exhibits the data for the 72 applications falling within the limits outlined in Table 7.20. If readers are following the specified admission procedure, cases falling in the first two categories will be rejected despite relatively high ATGSB scores, and those in the second two categories will be accepted despite relatively low ATGSB scores. In fact, there is some evidence to suggest that this may be happening.

Table 7.29

Number of Math Courses Taken by Accepted and Rejected Applicants

Range	Accepted Number	Accepted %	Rejected Number	Rejected %	% of Range Accepted	% of Range Rejected
0	0	0	5	4	0	100
1-3	44	38	48	35	48	52
4	25	22	19	14	57	43
5	20	17	26	19	44	56
6	7	6	17	12	29	71
7-9	13	11	15	10	47	58
$\geq$ 10	7	6	8	6		
	116	100	138	100		

However, the single applicant in the first category and extremely small numbers accepted in toto preclude meaningful generalization from these data despite a .001 chi-square significance. See Table 7.30 page 7-66.

The number of technical courses taken is expected to vary with undergraduate major and average levels were assumed in developing the estimates previously displayed in Table 7.22 . These expectations proved to be amazingly close to actual results with one exception. Liberal arts and math students as a group were expected to have one or no technical courses. The data indicate that applicants from this combined group averaged 2.2 technical courses placing them only slightly below business and economics students who averaged 2.9. Separating liberal arts and math students discloses that liberal arts majors perform close to expectations. They average .9 technical courses per student. Math students with an average of 3.2 technical courses per student are responsible for the variance. The faculty perception that these two groups could be combined in a single category was clearly in error.

Table 7.31, p. 7-67, presents the distributions from this analysis. The total absenc of meaningful differences is verified by the chi-square significance level of .750.

Non Academic Experience was emphasized by many of the faculty members involved in the Master's Program Subcommittee. However, as noted earlier, the experience criteria was not universally accepted. Some faculty members argued that students coming directly from the undergraduate experience were more "academically oriented" and as such better prepared to participate in the rigorous Sloan School program. Under these circumstances we would be surprised to find experience emerging as a strong discriminator.

Table 7.32 confirms this schizophrenia. If anything the "get them before they've been perverted by the real world" point of view appears to prevail with an almost two-to-one rejection/acceptance ratio for applicants with years of non academic experience. See Table 7.32 page 7-68.

Table 7.30

"Motivation" Scale Values Based on Grade Point and ATGSB For Accepted and Rejected Applicants

Motivation Measure ATGSB	Cum	Accepted Number	%	Rejected Number	%	% by Measure Accepted	Rejected
≥ 700	< 4.0	0	0	1	2	0	100
600-699	< 3.5	3	27	7	11	30	70
500-599	> 4.0	3	27	36	60	8	92
≤ 499	> 3.5	5	46	17	27	23	77
		11	100	61	100		

Table 7.31

Number of Technical Courses Taken by Applicants
Classified by Undergraduate Major

Major	Range	Accepted Number	Accepted %	Rejected Number	Rejected %	Average Accepted	# Courses Rejected
Engineering and Science	≥ 16	13	11	15	11	11.7	11.8
	13-15	9	8	22	16		
	10-12	20	17	19	14		
	≤ 9	14	12	19	14		
Business and Economics	≥ 6	9	8	6	4	3.1	2.6
	4-5	9	8	8	6		
	≤ 3	27	23	28	20		
Liberal Arts and Math	≥ 4	3	3	6	4	2.2	2.2
	2-3	2	1	5	4		
	0-1	10	9	9	7		
		116	100	138	100		

Table 7.32

Non Academic Experience of Accepted and Rejected Applicants

Experience Years	Accepted Number	Accepted %	Rejected Number	Rejected %	% by Years Experience Accepted	% by Years Experience Rejected
0	50	43	51	37	50	50
1	28	24	25	18	53	47
2-10	36	31	61	45	37	63
≥ 10	2	2	1	0	67	33
	116	100	138	100		

While the overall distribution suggests indifference with respect to the total absence of non-academic experience, evaluation of the M.I.T. undergraduates applying to the Sloan School reveals a stronger bias toward continuing the academic process once it is begun. Sixteen of the twenty-six M.I.T. applicants with no work experience (62%) were accepted, as were eleven of the eighteen with one year's experience (60%).

The acceptance ratio for M.I.T. undergraduates hints at one factor responsible for the tendency to accept students directly from undergraduate programs. Thirty-one out of 52 (60%) of the M.I.T. applicants were accepted. In contrast, eighty five out of 202 or 42% of the non M.I.T. applicants received favorable decisions. While some faculty members would undoubtedly argue that these ratios simply reflect the quality of M.I.T. undergraduates and the compatibility of M.I.T. undergraduates with the Sloan School approach, it should be noted that these ratios are maintained in the face of a concerted program to produce a heterogeneous, non-M.I.T. biased, student body. It is not surprising to find this tendency to favor the known commodity. Familiarity with undergraduate professors writing letters of recommendation, experience with courses taken and even personal knowledge of the candidates, all argue for keeping the good student who has already proven himself in the environment and "knows the ropes." "A bird in the hand is worth two in the bush."

Participation in extracurricular activities was viewed by the Committee as an indication of student involvement, motivation, and ability to work well with others. The data summarized in Table 7.33 suggest that involvement in one or two activities may not be considered significantly different from no participation at all. There may be a slight bias favoring the applicant with four or more extracurricular activities to his credit. However, the impact is marginal with a chi-square significance of .10. See Table 7.33 page 7-70.

Leadership positions were considered indicative of management potential by a majority of the subcommittee members. You will recall that this characteristic is

Table 7.33

Participation in Extra Curricular Activities
by Accepted and Rejected Applicants

Range	Accepted		Rejected		% by Range	
	Number	%	Number	%	Accepted	Rejected
0	6	5	12	9	33	67
1	15	13	20	14	43	57
2	20	17	37	27	35	65
3	28	24	34	25	45	55
≥ 4	47	41	35	25	57	43
	116	100	138	100		

the basis for a dimension of evaluation and that evidence of this trait is sought in three of the input sources: extracurricular activity, letters of recommendation, and the written statement of plan.

The data summarized in Table 7.34 suggest that evidence of leadership roles may contribute to a positive assessment. Fifty percent of those accepted had occupied leadership positions. However, the odds are not dramatic. Even with a chi-square significance level of .025, the prospective applicant to the Sloan School would be well advised to spend his time boning up on the ATGSB exams as opposed to campaigning for class president. See Table 7.34 page 7-72.

The letter of recommendation summary assessment is highly regarded by most application readers as a source of comparative information from a third party who has had extensive exposure to the candidate. This weighting assumes that those providing recommendations are both acquainted with the candidate and willing to provide an objective assessment of his weaknesses as well as strengths.

Table 7.35 makes clear that very few writers give applicants below average ratings. In fact, no person requested to write a letter of recommendation considered the qualification of the candidate he was assessing to be "questionable." This phenomenon might be explained by either of two conditions. It is possible that applicants are sufficiently accurate in their assessment of potential evaluators so they simply do not ask those who might evaluate them negatively to submit letters. On the other hand, it may be that those requested to write letters of recommendation are too flattered, intimidated, or guilt ridden to give uncomplementary assessment. It may even be that rather than give a negative rating the assessor simply "forgets" to return the recommendation form. See Table 7.35 page 7-73.

It is important to recognize that many of the most positive and extensive letters of recommendation are submitted on other than the standard form and as such fall into the "no scaled assessment given" category. A strong positive influence can clearly

Table 7.34

Leadership Positions Held by Accepted and Rejected Applicants

Range	Accepted Number	Accepted %	Rejected Number	Rejected %	% by Range Accepted	% by Range Rejected
0	29	25	48	35	38	62
1	26	22	41	30	39	61
≥ 2	61	53	49	35	56	44
	116	100	138	100		

Table 7.35

Letter of Recommendation Assessment of
Accepted and Rejected Applicants

Average Assessment	Accepted		Rejected		% by Category	
	Number	%	Number	%	Accepted	Rejected
Equal to best in any department	67	19	42	10	61	39
Will perform at superior level	208	60	188	45	53	47
Performance up to average	33	9	116	29	22	78
Marginal, but deserves to go	2	1	16	4	11	89
Questionable whether merits	0	0	0	0	-	-
Not able to judge	3	1	10	2	23	77
No scaled assessment given	23	7	14	3	62	38
Letter not received	12	3	28	7	30	70
	348	100	414	100		

be imputed to these letters since this category yields one of the highest levels of acceptance.

The entries in Table 7.35 total 762 rather than 254 since three letters of recommendation were coded for each applicant.

Chi square analysis of the distributions from this table produces a significance level of .001. The actual chi-square value (71.044 with six degrees of freedom) is second only to those obtained in the analyses of the ATGSB total score and the adjusted cumulative grade point[1].

1966 Procedures Revisited

Before leaving these data, it might be fun to see what would have happened if the decile ranking system developed in 1966 had been applied to the 1970 and 1971 applicants. You will recall from the earlier discussion that faculty members evaluating applications in 1966 "... refused very few applicants whose combined decile totaled 11 or above and ... accepted very few with decile ratings totaling eight and below.[2]

Table 7.36 shows how our sample of 1970 and 1971 applicants to the Sloan School would have fared under the 1966 decile ranking procedure. The acceptance and rejection figures shown in this table are those established by the 1970 and 1971 decisions. See Table 7.36 page 7-75.

Seventy-three out of 82 or 90% of the applicants who would have been rejected by the 1966 criteria were also rejected by the 1970 and 1971 admissions procedure. On the other hand, 42 out of 137 or 30% of the applicants who would have been accepted under the 1966 procedures were rejected in 1970 or 1971. Thus, the net effect of procedures implemented between 1966 and 1970 has been to reject students who would have been accepted under the earlier criteria.

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[1] The X^2 values for the analyses of ATGSB total score and the adjusted cumulative grade point average are both exactly equal to 73.562 with seven degrees of freedom, an unlikely but true statistic.

[2] Excerpt from March 1967 memorandum from the Program Administrator to members of the Masters Program Committee.

Table 7.36

Decile Rankings of Accepted and Rejected Applicants Using 1966 Procedure

	Decile Score	Accepted Number	Accepted %	Rejected Number	Rejected %	% by Score Accepted	% by Score Rejected
	≤ 4	4	3	36	26	10	90
	5	0	0	12	9	0	100
	6	1	1	6	4	14	86
	7	1	1	12	9	8	92
1966 Reject	8	3	3	7	5	30	70
	9	9	8	10	7	47	53
	10	3	2	13	9	18	82
1966 Accept	11	4	3	7	5	36	64
	12	9	8	8	6	53	47
	13	7	6	8	6	46	54
	14	11	10	0	-	100	0
	15	9	8	4	4	70	30
	≥ 16	55	47	15	10	78	22
	TOTAL	116	100	138	100		

It is of course obvious that the 1966 criteria could not have been carried unmodified into the seventies. The larger number of applicants and increasing cumulative grade point and ATGSB scores would force raised standards if the entering class were to be maintained at the 100 student level.

We have now exhausted the objective data available from applications received in 1970 and 1971. Validation of measures involving subjective reader evaluation must be based on 1971 data since the required reader assessments were only obtained in that year.

Table 7.37 summarizes the chi-square significance levels obtained when the procedures described earlier in this chapter were used to code data from each of the input sources for application to the seven dimensions of evaluation. (See page 7-77). Values indicated for the 1970 and 1971 population are based on 254 applications. Those displayed for 1971 are derived from analysis of 99 applications from that year included in the sample. The chi-square significance values indicated for the total dimension are based on the combined score for each dimension computed by summing the scores derived for each element using the procedures summarized in Table 7.23.

The rows of this table summarize the significance of the five types of input to the admissions process in Table 7.23. As noted earlier, the ATGSB total and mathematics scores are decisive discriminators of perceived native and mathematical ability respectively. The proposed measures of academic performance appear to explain perceived native ability and motivation reasonably well. The "number of math courses taken" criteria proposed as an indication of mathematical orientation has less explanatory power. The evaluation of "commitment to technical competence" based on the number of "technical courses" recorded in the undergraduate transcript fails totally. The previously noted disagreement regarding the importance of non academic experience is reflected in the inconclusive results obtained in both the 1971 and the combined 1970 and 1971 samples. The proposed "leadership" and "motivation" coding schemes appear to explain

Table 7.37

Chi Square Significance Levels For Processed Inputs on Seven Dimensions (70/71 and 1970)

Inputs	Dimensions of Evaluation: Native Ability		Mathematical Ability		Experience		Leadership		Motivation		Seriousness of Intent		Commitment to Technical Competence	
	70/71	1971	70/71	1971	70/71	1971	70/71	1971	70/71	1971	70/71	1971	70/71	1971
ATGSB	.001	.001	.001	.005										
Academic Performance	I	.025	I	.075					.001	.025			.750	.750
Extracurricular Activities					.250	.250	.100	.100	NA	.100				
Letters of Recommendation	.001	.025			NA	.500	NA	.050	NA	.025	NA	.500	NA	.100
Written Statement	NA	.250			NA	.500	NA	.005	NA	.001	NA	.001	NA	.005
Total Dimension (Combined Inputs)		.01		.25		.75		.02		.01		.01		.25

I = Incomplete Data in 1970
NA = Not Available in 1970

some of the admissions process.

As suspected, letters of recommendation clearly contribute to applicant assessment. However, the recommenders' highly structured comparative evaluation of the applicant appears to be the one uniformly predictive input. The more elaborate appraisal of letter content associated with the experience and seriousness of intent dimensions do not reveal an underlying logical structure. On the other hand, the content oriented coding procedures proposed for leadership and motivation appear to reflect some of the reader's thought processes.

The applicant's written statement of plans for graduate study does not appear to contribute to reader assessment of native ability. It is, however, the most important input to their evaluation of leadership, motivation, seriousness of intent, and commitment to technical competence.

Turning to the columns of Table 7.37, it is evident that the key dimensions in the Sloan School admission process are: (1) native ability as measured by the ATGSB score, cumulative grade point and recommendator's classification, (2) seriousness of intent judged on the basis of the applicant's written statement of his plans for graduate study, (3) motivation inferred from the plan for graduate study, past academic performance, and letters of recommendation, (4) leadership potential inferred from the applicant's written statement and, to a lesser degree, letters of recommendation.

Mathematical ability may be important to the Sloan School faculty. However, because of pre-selection or the high correlation between mathematical ability and total ATGSB score, evaluation along this dimension is seldom critical.

The concept of "commitment to technical competence" may be prominent in the minds of some readers. However, the subcommittee's supposition that readers gauge commitment on the basis of past academic performance or letters of recommendation was not borne out. Relevant impressions on which evaluation along this dimension are based would

appear to come from the applicant's written statement.

If there was any consistent emphasis on experience in the minds of the faculty members reading applications in 1970 and 1971, the coding structures proposed by the subcommittee failed to detect it. It is interesting to note that in 1972 the Sloan School introduced a new one year Masters program "designed to accommodate a limited number of persons highly motivated to expedite their career development."[1] Admissions criteria for this intensive program stress that

> ... only those applicants having outstanding records of prior performance and evidencing strong motivation will be considered for admission. In the belief that prior work experience helps the student to understand the relevance of both theory and methodology, preference will be given to persons who have had such experience. [2]

It will be interesting to see whether the proposed measures verify that the apparent intent to admit applicants with greater experience to this program is realized.

Differences Among Readers

Although we have succeeded in veryifying major segments of the previously proposed admissions process model, it is clear that in some instances (e.g., the experience dimension) model formulation is frustrated by the incongruity of reader values.

Table 7.38 provides ample evidence of the differential emphasis placed on the seven dimensions by two faculty and one student reader. The fourth row of Table 7.38 repeats the total dimension chi-square significance values presented in Table 7.36. See Table 7.38 page 7-80.

The data in this table show that the seven dimensions (more correctly

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[1] From a Sloan School brochure advertising the new program.

[2] Ibid.

Table 7.38

Chi Square Significance Levels of Seven Dimensions For Three Readers

	Native Ability	Mathematical Ability	Experience	Leadership	Motivation	Seriousness of Intent	Commitment to Technical Competence
Student	.01	.01	.20	.10	.01	.01	.01
Faculty A	.50	.50	.70	.20	.05	.10	.10
Faculty B	.01	.05	.70	.10	.05	.30	.30
Total Sample	.01	.25	.75	.02	.01	.01	.25

the seven dimensions plus the coding structure) closely parallel the concepts used by the student, provide only a fair representation of faculty member B's thoughts, and fail to explain the basis for much of faculty member A's decision process.

Both the student and faculty member B place heavy emphasis on native ability, mathematical ability, and motivation. The student shares faculty member A's concern with seriousness of intent, and technical competence. He also places higher emphasis on experience than either faculty member or, for that matter, the total sample.

We have noted that the student's behavior is best explained by the model. It might be more correct to say that the model strongly influenced the student's behavior. The student in question was Jim Monk whose thesis produced the data on which this chapter is based. Since he had been involved with the theoretical formulation of the dimensions and coding procedures before reading these applications, it is not surprising to find the underlying concept and scoring procedures reflected in his decision making. Faculty member B whose actions are relatively well explained by the model had also been involved in developing and coding system used on the dimensions. Faculty member A was aware of the seven dimensions and the general characteristics of the coding structure at the time when he read the applications. However, he avoided detailed contact with the model structure until his reading was completed.

While inconclusive, these data suggest that:

(1) The student has internalized the value system expressed in the model

(2) Faculty member B has either encoded certain of his ideas in the model or been influenced by its formulation.

(3) Faculty member A is strongly biased toward highly motivated applicants and tends to minimize the importance of academic performance and mathematical aptitude.

(4) The coding structures associated with four of the seven dimensions are more representative of the reader population as a group than of any individual faculty.

Since the student's thought process appears to most closely parallel the explicit scoring structure of the model it may be useful to compare his decisions with those of the total faculty population. Table 7.39 summarizes the four point grades (A-D) assigned 99 applicants by Jim Monk (the student) and six faculty readers. See Table 7.39 page 7-83.

The diagonal values in this table disclose that Mr. Monk and the faculty readers assigned identical grades to 52 of the 99 applicants. In 26 of the remaining cases, the faculty assigned higher ratings than the students, leaving 21 cases in which the faculty's assessment was lower than that of the student.

Table 7.40 compresses the four categories exhibited in Table 7.39 into two categories (A-B and C-D). With this somewhat cruder classification scheme student and faculty evaluations are congruent in 81 of the 99 cases and a distinctly positive faculty bias emerges. Faculty readers assign higher ratings to 12 of the 18 applicants who were classified differently. See Table 7.40 p. 7-84

Enter the Computer

We have already noted that Mr. Monk appeared to have internalized the explicit model structure to a greater extent than any faculty member. It is, of course, possible to produce an applicant evaluator that will perfectly internalize the admissions model. This evaluator would be a computer.[1]

The data discussed earlier in this chapter suggest that different readers

[1]The model discussed in this section was developed by Professor Jack Rockart of the Sloan School of Management and reported in the previously noted thesis by James Monk.

Table 7.39

Four Category Student and Faculty
Evaluations of 99 Applicants

	Faculty Evaluations				
Student Evaluation	A	B	C	D	Student Totals
A	25	14	2	2	43
B	6	2		2	10
C	1	3	1	1	6
D	3	5	8	24	40
Faculty Totals	35	24	11	29	99

Table 7.40

Two Category Student and Faculty
Evaluation of 99 Applicants

	Faculty Evaluation		
Student Evaluation	A or B	C or D	Total
A or B	47	6	53
C or D	12	34	46
Total	59	40	99

have different reasons for accepting a candidate. If the current admissions process is to be duplicated it must, therefore, be possible to admit a candidate for one of several reasons. Detailed analysis of data presented in Table 7.38 suggest three fundamental grounds for admissions: superior academic performance (intellectual ability), leadership potential, or strong motivation ("entrepreneurial drive").

While working with these data, Professor Jack Rockart at the Sloan School of Management suggested that various faculty members might be imposing different "acceptance thresholds" on the seven dimensions of evaluation. Extension of this reasoning led to eight "patterns" which appear to explain much of the behavior of those responsible for admissions at the Sloan School. These patterns are summarized in Table 7.41, page 7-86.

The minimum total scores referenced in the rightmost columns of Table 7.41 indicate the minimum cumulative value required on each of the eight patterns. These total scores refer to the combined values summarized in Table 7.23 . Thus the requirement of pattern one for a plus five value on the native ability dimension and a zero or greater value on the motivation dimension should be considered in light of the possible range of values indicated in Table 7.23 (-11 to +10 for native ability and -6 to +7 for motivation).

The process followed by the computer programmed to evaluate applicants using these patterns is illustrated in Figure 7.2 . The computer is first directed to set a control variable "a" to 1 indicating the first applicant. It then sets to zero an indicator, "REVIND", used to note when an applicant meets the requirements for review. Scaled values for the relevant dimensions are then computed following the procedures outlined in Table 7.22. See Figure 7.2 page 7-87.

The computer then sets a counter, "p", to 1 indicating that the first pattern is now to be tested. The values for the native ability and motivation

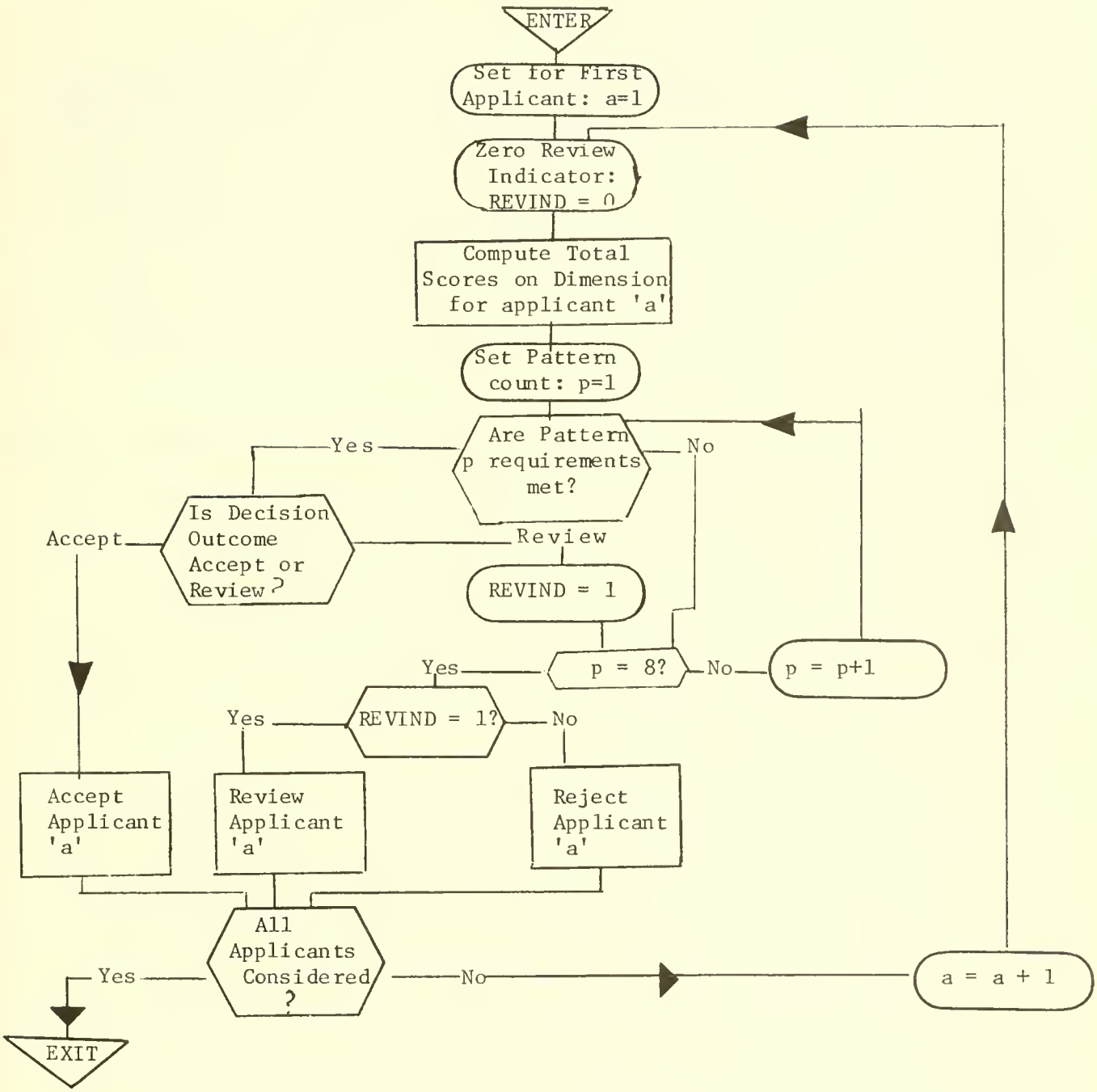
Table 7.41

Eight Evaluative Patterns Based on
Four Admission Process Dimensions

Pattern	Admission Criteria	Decision Outcome	Minimum Total Score on Dimension			
			Native Ability	Experience	Leadership	Motivation
1	Intellectual Ability	Accept	5	-	-	0
2	Intellectual Ability	Accept	4	-	-	1
3	Intellectual Ability	Review	4	-	-	0
4	Leadership Potential	Accept	1	-	4	2
5	Leadership Potential	Accept	1	-	3	3
6	Leadership Potential	Review	1	-	3	1
7	Entrepreneurial Drive	Accept	-5	2	-	3
8	Entrepreneurial Drive	Review	-2	-	2	2

Figure 7.2

Computer Based Admission Process
Based on Eight Evaluation Patterns



dimensions are compared against the references specified for pattern one. If the required conditions are met (e.g., native ability equal to or greater than 5 and motivation equal to or greater than zero) the computer tests to determine if the decision outcome associated with the pattern was "accept" or "review". If the associated decision was "accept" the applicant is accepted and the computer turns to the next application. If the decision outcome was "review" the review indicator, REVIND, is set to 1 and the computer checks to see if additional patterns remain to be considered (e.g., that p has a value less than 8). If additional patterns remain the pattern indicator "p" is incremented and the process continues until the applicant is accepted or all patterns have been analyzed.

When the evaluation of pattern eight has been completed the computer tests to determine whether the review indicator is equal to 1 or zero. If it is 1, the applicant is scheduled for review; if not the applicant is rejected.

The computer next checks to determine whether all applicants have been considered. If they have, it "exits" from the program. If applicants remain to be considered the applicant counter "a" is incremented and the process continues for the next applicant.

The results achieved when this program was applied to the ninety-nine 1971 applications analyzed in this chapter are summarized in Table 7.42 The computer duplicated seventy of the 99 admission decisions ultimately made in 1971. It would have reversed 18 of these decisions accepting 14 of the applicants who were ultimately rejected and rejecting 4 who were ultimately accepted. Eleven applicants would have been referred to the Committee for further review. Of these, 9 would have been accepted and 2 rejected. See Table 7.42 page 7-89.

How "good" is this computer evaluation? One way of answering this question is to compare the decisions made by the computer with those made by the faculty readers examined earlier in this chapter. We will exclude Mr. Monk's decisions from this analysis because of his model oriented bias. For purposes of this

Table 7.42

Comparison of Decisions Made By
Computer Model and Admissions Procedures

	Computer Decisions			
Admission Decisions	Accept	Review	Reject	
Accept	33	9	4	46
Reject	14	2	37	53
	47	11	41	99

comparison we will interpret an "A" rating by the faculty reader as "accept", a "D" rating as "reject", and a "B" or "C" evaluation as "review." The results of this comparison are presented in Table 7.43, page 7-91.

A comparison of the two tables discloses that the computer and faculty readers accepted almost precisely the same number of applicants (33 and 32 respectively) actually accepted by the admission procedure. The computer rejected substantially more (37 as opposed to 27) of the 53 applicants actually rejected by the Admissions Committee.

The major difference is the number of applicants scheduled for "review". While rejecting 14 of the applicants actually accepted by the admissions procedure, the computer scheduled only 11 for further review. In contrast, the faculty readers left 35 applications for consideration by others.

In final analysis the most striking difference between the computer and the faculty readers is the computer's "willingness" to make decisions. The computer classified 88 of the 99 applications presented to it, while the faculty readers assigned "A's" or "D's" to only 64.

The Student's Decision To Attend

The admissions procedures examined in the preceding section determine which applicants will be offered an opportunity to attend a particular institution. But these decisions do not determine the composition of the entering class. The majority of the students accepted by an institution will decline to attend.

In the following chapters we will have an opportunity to examine the students who accept the offer of admission and attend one of the schools in our study. But what of the students who decide not to attend -- the ones that got away? Do they differ from those who enroll in any significant manner, or can it be assumed that this aspect of the admissions process can be considered random -- that both groups are drawn from a relatively homogeneous population?

Table 7.43

Comparison of Faculty Reader Decisions and Results of Admission Procedures

	Faculty Reader Decisions			
Admission Decision	Accept	Review	Reject	
Accept	32	12	2	46
Reject	3	23	27	53
	35	35	29	

The administrative implications of these questions should be clearly evident. An understanding of the characteristics of those who choose not to attend after being accepted will enable an admissions committee to more accurately predict the composition as well as the size of the entering class. A discovery that desirable candidates who are accepted by several insitutions are choosing the "competition" may alert the manager to actual or perceived disadvantages vis-a-vis other graduate schools.

During the summer of 1970 all students admitted to the Sloan School Master's Program were asked to complete the Pre-Term Questionnaire. The letter accompanying the questionnaire requested that they participate in the research whether or not they planned to attend M.I.T. and asked that they write "coming", "not coming" or "undecided" on the cover of the questionnaire booklet. The letter also emphasized that the study was independent of normal admissions procedures and that participation in this research was voluntary.

One hundred and twenty of the 250 applicants accepted by the Sloan School responded to the questionnaire. Fifty-five of these indicated that they were "coming", 37 that they would not attend, and 28 "undecided". A later analysis revealed that the majority of the "undecided" ultimately attended the Sloan School. However, for purposes of this analysis we are concerned with their orientation at the time when the questionnaire was completed. As such, their self assessment at that time is accepted as the basis for classification.

The four data sets associated with the Pre-Term Questionnaire (demographics, expectations, self perceptions and attitudes) were examined. Items on which members of the three groups exhibited significantly different responses will be noted in this section. Data from the remaining items will be discussed in Chapter 8 and, in the absence of significant differences, the responses of the "entering students" reported in that chapter may be considered representative of those obtained from all three sample groups.

Demographic Differences

Chi-square analyses of the demographic data from the Pre-Term Questionnaire disclosed three questions to which members of the three subgroups gave significantly different replies. One of the three significant questions was predictable, "How certain are you of your decision to attend this particular graduate school?" The information derived from these responses did little except assuage our battered faith in ultimate rationality.

Those who were "not coming" expressed many more doubts than the undecideds or those who were "coming". These distributions which are significantly different at the .01 level are displayed in Table 7.44 page 7-94.

The other two demographic questions that produced significantly different responses were more enlightening. When asked, "When did you decide upon this program of graduate study?" the majority of those in the "coming" group indicated that their program had been planned either in their Junior or Senior year in college or after working. In contrast, the largest number of those "not coming" had made their decisions immediately after college graduation, presumably during the summer in which they were asked to complete the questionnaire. The response distribution for the undecideds closely paralleled that of the "coming" as shown in Table 7.45. Chi-square analysis indicates that these distributions are significantly different at the .01 level. See Table 7.45 page 7-95.

The third demographic question producing significantly different responses from the three groups was, "Have you served in the armed forces?" Table 7.46 p. 7-96 presents the response distributions for the three groups. Once again the "coming" and "undecideds" have equivalent distributions with a four-to-one no service to service ratio. In contrast, 41% of those "not coming" have served in the armed forces.

Differences in Expectations

Expectation data from the three groups were analyzed using the now familiar discriminant analysis procedures.

Table 7.44

Certainty Regarding Graduate School Reported by "Coming," "Not coming," and "Undecided" Admittees

Cetainty of Decision	Coming		Undecided		Not Coming	
	Number	%	Number	%	Number	%
Many Doubts	1	2	-	-	5	17
Some Doubts	5	9	4	15	8	27
Certain	8	15	5	19	8	27
Very Certain	16	29	6	23	7	23
Absolutely Certain	24	45	11	42	2	6

Table 7.45

Time When Graduate School Program Selected by "Coming", "Not Coming", and "Undecided" Admittees

Decided on Current Program	"Coming" Number	%	"Undecided" Number	%	"Not Coming" Number	%
In High School	7	13	1	4	2	7
As College Freshman	2	4	1	4	2	7
As College Sophomore	5	9	-	-	2	7
As College Junior	14	26	6	23	4	13
As College Senior	12	22	9	35	4	13
After College	1	2	-	-	9	30
After Work	13	24	9	35	7	23

Table 7.46

Service in Armed Forces by "Coming," "Not Coming" and "Undecided" Admittees

Military Experience	"Coming" Number	%	"Undecided" Number	%	"Not Coming" Number	%
Served in Armed Forces	10	18	5	18	15	41
No Service	45	82	23	82	22	59

Expectations exhibited by members of the three groups were indistinguishable with one exception. This was Question 24 focusing on expected learning outcomes. The Centour of Group Centroids Matrix displayed in Table 7.47 page 7-98 indicates that the best discrimination is between the "not coming" and the "undecided" groups. In contrast to the consistent similarity between the "coming" and "undecided" demographics, the matrix suggests that the three groups have significantly different learning outcome expectations. This is confirmed by the Centour Diagram illustrated in Figure 7.3 page 7-99. The "undecided" group is labelled "unknown" in this figure.

From the Centour diagram it is clear that Function 1 separates those not coming from the other two groups. Analysis of the variable contributions reveals that the "not coming" group has significantly higher expectations regarding the institution's impact on their ability to analyze problems and their knowledge of business principles. On the other hand, this group has significantly lower expectations regarding the institution's probable influence on their knowledge of techniques. Function 2 discriminates between the "undecideds" and those who are "coming" on the basis of expected change in ability to communicate ideas, attitudes toward business and ability to do research. Those who are not coming expect more change along the first two dimensions than the other two groups. Those who are coming expect the least change in ability to communicate ideas, while the undecideds have the lowest attitude change expectations. The highest expectations regarding change in ability to do research are held by those who are coming to M.I.T. and, interestingly, conform most closely to the previously noted M.I.T. image.

Semantic Differential Data

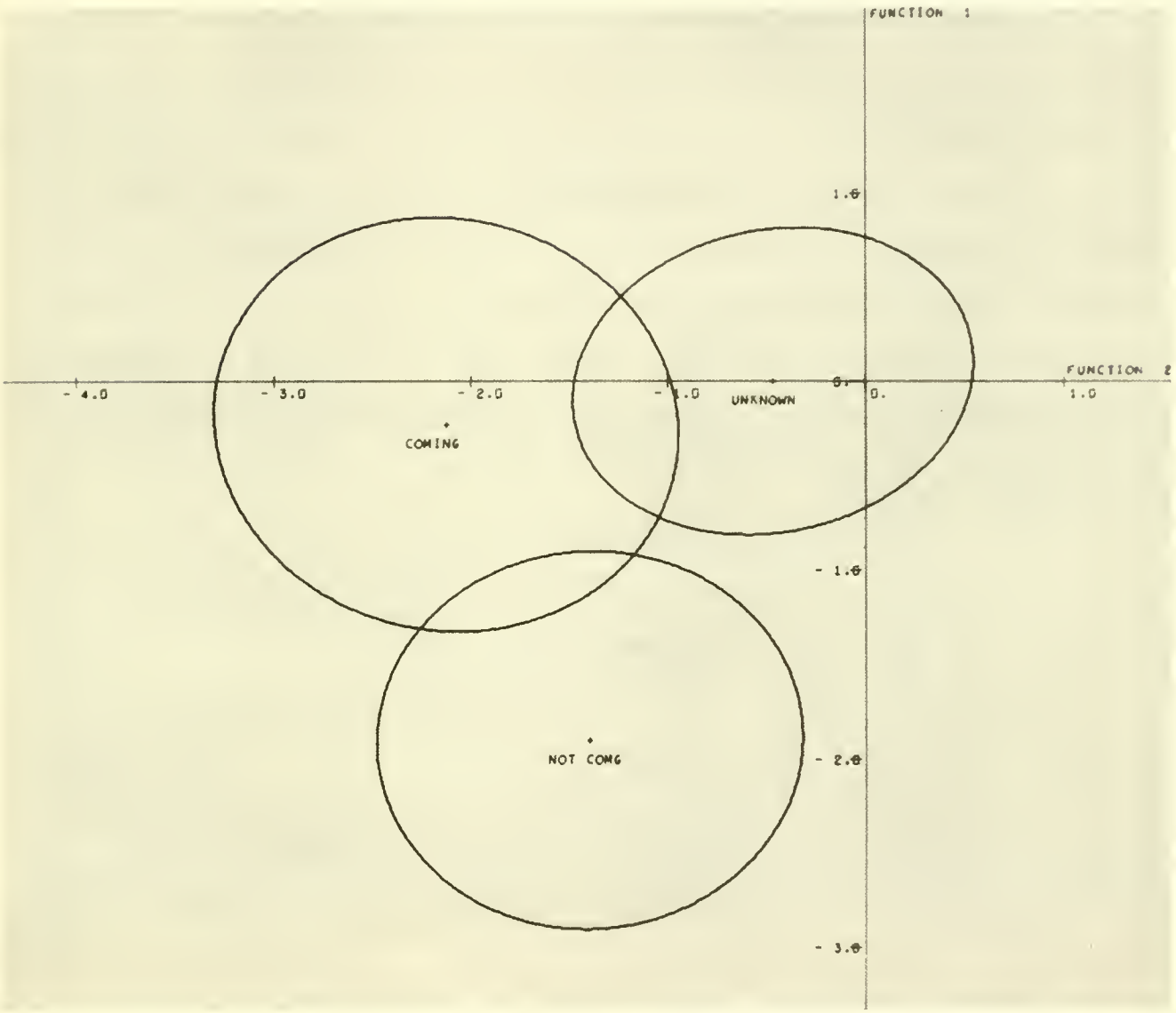
Examination of the adjective pair descriptions of self, ideal self, and typical manager reveals that the three groups are homogeneous along these

Table 7.47

Centour of Group Centroids Matrix for "Coming" "Undecided" and "Not Coming" Groups Based on Learning Outcome Expectations

Variable	Centroid Coming	Centroid Not Coming	Centroid Undecided
Coming	100.0000	19.3832	26.3139
Not Coming	27.2248	100.0000	5.4159
Undecided	35.8461	11.6674	100.0000

Figure 7.3 Centour Diagram for "Coming", "Not Coming" and "Undecided" (Unknown) Admittees based on Learning Outcome Expectation Discriminant Functions 1 and 2

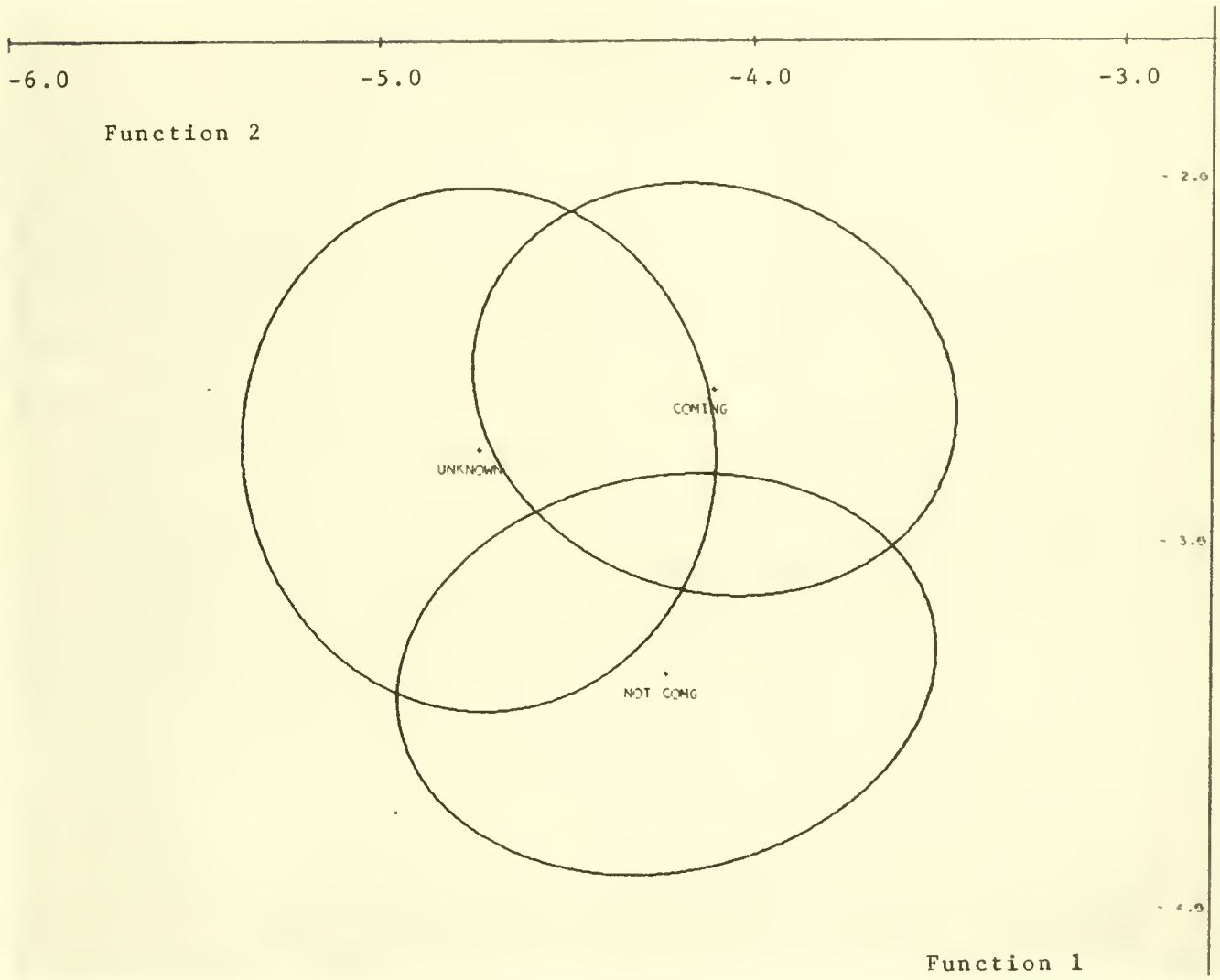


dimensions. We must therefore conclude that the decision to attend is not affected by these perceptions.

Personal Opinions

The three groups have marginally different opinions relating to several topics. However, two variables are primarily responsible for the discrimination achieved by both functions illustrated in Figure 7.4 page 7-101. The first of these involves the extent of corporate social responsibility and community obligation. The second focused on Theory X versus Theory Y approaches to subordinate-superior relationships. Those who are "not coming" place greater emphasis on the corporation's social and community responsibilities and have a more cooperative and sensitive orientation toward organizational relationships.

Figure 7.4 Centour Diagram for "Coming", "Not Coming" and "Undecided" (Unknown) Admittees based on Personal Opinion Discriminant Functions 1 and 2



Chapter 8

The Entering Graduate Student

"If a little knowledge is dangerous, where is the man who has so much as to be out of danger?"[1]

This chapter follows those who successfully ran the admissions gauntlet, were accepted by one of the schools included in this study, and elected to devote approximately two years to a graduate management program offered by one of five graduate schools -- The Amos Tuck School of Management at Dartmouth, Boston College, The M.I.T. Sloan School of Management, Stanford University, and Southern Methodist University.

Basic characteristics of the management programs associated with these institutions are summarized in Table 8.1. See Table 8.1, p. 8-2, 8-3, and 8-4.

Later chapters are concerned with the changes that occur as students in each institution participate in the curricular and extra curricular activities associated with these Master's programs. The current objective is to establish a reference point indicating the initial characteristics of students entering these programs. How are they similar? In what ways are they different? The expectations data examined in Chapter 7 provided some information on this topic. However, we have yet to consider the demographics, self perceptions, and personal opinions of those who ultimately attend each school.

Since faculty members as well as students are expected to play major roles in the academic spectacle reviewed by this study, similarities and differences among faculty members at the five schools will also be examined.

With measures supplied by both entering students and faculty members in hand it should be a relatively simple matter to compare the expectations and

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[1] T.H. Huxley, On Elemental Instruction in Physiology, 1877.

Table 8-1 Summary Comparison of Five Graduate Schools of Management

	Duration Enrollment Degree Master's Program	Other Advanced Degrees DBA/Ph.D. Enrollment Degrees	Part Time	Location	Founded
Boston College Graduate Division: School of Management	2 years/ 350 MBA		✓	Chestnut Hill Mass, 6 miles West of Boston	1957
Dartmouth College Amos Tuck School of Business Administration	2 years/ 250 MBA			Hanover, New Hampshire 140 miles north- west of Boston	1900
Massachusetts Institute of Technology The Alfred P. Sloan School of Management	2 years/ 200 SM	Ph.D./ 65		Cambridge, Massachusetts	1952
Southern Methodist University School of Business Administration	1 year/ 50 MBA		(350) ✓	University Park, Texas, 5 miles from Dallas	1911
Stanford University Graduate School of Business	2 years/ 529 MBA	Ph.D./89 J.D./MBA Master of Ex. Administration		Stanford, California 30 miles south of San Francisco	1925

Table 8-1 Continued

	Faculty Total	Tuition	Expected Total Expenditure
Boston College	80*	$2,090 + $95 fee $276.00/course	$3,600 + travel
Dartmouth College	27	$2,970	$5,485- $5,685 incl. travel
Massachusetts Institute of Technology	70*	$2,650	over $5,000
Southern Methodist University	90*	$800 per semester ($2,400 per year) $180 per 3 hour course	no estimate
Stanford University	74	$2,800	$5,600

*Graduate and Undergraduate

Table 8-1 Continued

	Course Requirements First Year	Second Year	Thesis	Financial Aid Loan	Scholarship Grant Fellowship	Academic Calendar 1/4	Semester
BOC	(54 credits total 18 semester hours) 11 required, 7 elective		✓	None First Year 2nd Year Teaching and Research Assistant			✓
ATK	7 required courses	1 required course + electives		✓	✓	✓	
SSM	All required	Elective	✓	✓	Teaching and Research Assistant ✓		✓ 12
SMU	One Year Program 42 Semester Hours Fall 15 Spring 15 Summer 12 21 hours required/21 elective			✓	✓		✓
STN	5 courses per quarter (45 units)	4 courses per quarter (48 units) elective		$7,000 maximum loan ✓	$100-4,000 fellowship ✓	✓	

perceptions of these two groups based on information provided by students via the Pre Term and Course Evaluation Questionnaires and faculty inputs obtained through the Pre and Post Course Questionnaires.

Comparative Entering Student Attributes

It is reasonable to suppose that students entering a graduate program focusing on a single profession - management - will share common goals, values, and expectations. Similarities among the five graduate populations would therefore be expected to outweigh the differences. Moreover, such differences as do exist should be largely attributable to regional or pedagogical differences appropriately ascribed to each school.

The managerial issues motivating this analysis follow logically from those raised in Chapter 7. If students attending a particular school differ markedly from those entering comparable programs at other institutions, a responsible administrator must be aware of and able to explain these differences on the basis of the population from which applicants are drawn, admissions procedures, and real or imagined program characteristics.

Following the procedure suggested in Chapter 6 it may be useful to note your preconceptions regarding the nature and implications of the differences that will be encountered. In this way your intuition will be translated into explicit hypotheses that can be tested against data developed in the following sections.

Demographics

Chi square analysis of demographic responses from students at the five graduate schools brings out eight characteristics for which the populations are significantly different at the .01 level of significance, and two attributes significantly different at the .05 level.

Religious Affiliation and Commitment

Institutional and regional factors largely explain the religious affiliations reported by students entering the five institutions. Boston College has more Catholics while Southern Methodist is decidedly Protestant. The greatest number and proportion of Jewish students are found at the Sloan School of Management which exhibits the most nearly balanced distribution of religious affiliations.

The lowest levels of religious commitment are reported at M.I.T. and Stanford where 49 and 42% of the students respectively state they are "not at all religious." Southern Methodist and Boston College have the fewest students in this category while Dartmouth with 31% establishes the midpoint. Related distributions displayed in Table 8-2 (page 8-7) are significantly different at the .01 level.

Experience

Students entering the five graduate schools produce significantly different work and armed services experience distributions. Both data sets displayed in Table 8-3 have chi square significances of .01. Those entering Boston College and Southern Methodist have substantially greater work experience. Sixty three percent of the Southern Methodist population have worked at least two years while 27% have more than 5 years experience. Forty-four percent of the Boston College students have worked for two or more years while, at the opposite extreme, 70% of those entering Amos Tuck have no work history. See Table 8-3, page 8-8.

The Stanford population yields the greatest proportion with service in the armed forces (52%) while the M.I.T. Sloan School with 25% is at the low end of the armed forces experience dimension.

Undergraduate Majors

A large proportion of those entering the M.I.T., Stanford, and S.M.U. programs (40, 41 and 57% respectively) have undergraduate majors in engineering. In contrast, the largest proportion of Amos Tuck students (37%) majored in

Table 8-2 Religious Affiliations and Commitment of Students in Five Graduate Management Programs

Response Category	Number of Respondents at Each School				
	Boston College	Amos Tuck	Sloan	SMU	Stanford
Religious Affiliation					
1) Protestant	10	62	42	53	38
2) Catholic	34	24	20	6	8
3) Jewish	7	4	21	2	0
4) None	1	12	21	2	8
5) Other	0	3	6	1	1
Religious Commitment					
1) Not at all religious	9	33	52	7	23
2) Somewhat religious	38	66	48	49	31
3) Very religious	5	6	6	8	1

Table 8.3 Non-Academic Experience of Students Entering Five Graduate Management Programs

Response Category	Number of Respondents at Each School				
	Boston College	Amos Tuck	Sloan	SMU	Stanford
Years of Full Time Employment					
1) None	14	73	53	9	22
2) Less than 1 year	8	7	13	5	7
3) 1 to 2 years	7	11	16	10	9
4) 2 to 5 years	11	8	16	23	14
5) More than 5 years	12	5	12	17	3
Service in Armed Forces					
1) Yes	24	37	28	21	28
2) No	29	67	82	43	26

economics while 53% of those entering Boston College majored in business as undergraduates.

The nine response categories represented in Table 8-4 have been formed by combining low incidence cells included in the questionnaire. Chi square analysis reveals that these distributions are significantly different at the .01 level. See Table 8-4, p. 8-10.

Timing of the Decision to Pursue Graduate Study

Very few of the students entering the five graduate programs decided to pursue graduate study while in high school. Amos Tuck has the largest number and proportion reporting that the decision was made in high school (8%).

The majority of those attending Dartmouth and the Sloan School made their graduate program decisions during their junior or senior year in college. In contrast, the greatest proportion of those entering Boston College, S.M.U. and Stanford made their decisions after graduating from college and/or working.

Response distributions associated with this issue are presented in Table 8-5, p.8-11.

Plans for Doctoral Study

The vast majority of Amos Tuck, S.M.U., and Stanford Master's students have no intention of pursuing a Ph.D. while a significant proportion (12%) of those entering the Sloan School Master's program intend to acquire a Ph.D. Some of these Sloan students undoubtedly view the Master's program as a vehicle for entering the Sloan School Ph.D. program, believing that once they have "their foot in the door" it will be easier to gain acceptance into the Ph.D. program. Realities may conflict with this expectation since a mirror image of the Master's program admissions committee's suspicion of Ph.D.'s frequently prevades the evaluation of doctoral candidate applicants. Nevertheless, the quantitative and analytic orientation of Sloan School Master's Program continues to cloud the distinction between theory (Ph.D.) and practice (Master's) as indicated by the data summarized in Table 8-6 page 8-12. Once again the distributions are

Table 8-4 Undergraduate Major of Students Entering Five Graduate Management Programs

Response Category	Number of Responses at Each School				
	Boston College	Amos Tuck	Sloan	SMU	Stanford
Undergraduate Major					
1) Biology, Chemistry, Physics	2	3	14	3	2
2) Psychology, Sociology Anthropology	0	5	3	1	1
3) Mathematics	1	3	13	4	2
4) Engineering	6	14	43	37	23
5) Economics	9	39	7	5	7
6) Business	28	23	18	8	7

Table 8-5 Timing of Decision to Pursue Graduate Study by Students Entering Five Graduate Management Programs

Response Category	Number of Respondents at Each School				
	Boston College	Amos Tuck	Sloan	SMU	Stanford
Timing of Decision to Pursue					
1) In high school	1	9	2	1	3
2) In freshman year of college	1	5	1	2	0
3) In sophomore year of college	5	7	8	1	2
4) In junior year of college	5	29	24	9	11
5) In senior year of college	13	22	27	10	10
6) After college graduation	11	13	9	15	14
7) After working	18	20	37	26	15

Table 8.6 Ph.D. Aspirations of Students Entering Five Graduate Management Programs

Response Category	Number of Respondents at Each School				
	Boston College	Amos Tuck	Sloan	SMU	Stanford
Plans to Pursue Ph.D.					
1) Intend to pursue Ph.D.	3	1	13	3	1
2) Do not intend to pursue	27	69	51	41	41
3) Undecided	23	35	43	20	13

significantly different at the .01 level.

Field of Specialization

Table 8.7 displays the intended field of specialization reported by students entering the five graduate management programs. Those who enter the Sloan School are clearly biased toward the computer-systems analysis oriented fields, management information systems, and operations research. Amos Tuck exhibits a strong finance franchise. The largest proportion of S.M.U. and Stanford candidates check the general management and business policy categories while marketing and general management tie for first place among Boston College students. See Table 8.7, p. 8-14.

Employment Associated Demographics

The two items which are significant at the .05 level provide an interesting juxtaposition of father's employment and student's "first job" objectives. The data exhibited in Table 8.8 summarize responses to the questions asking about father's employment and, "Where would you like to work on your first job?"

A marginally greater proportion of Sloan School and Boston College fathers are employed by government, educational or non-profit agencies. However, the largest number of fathers of students attending these schools are self employed or working for small companies. Similarly, while slightly more Amos Tuck and Stanford fathers work for large companies, the greatest proportion fall in the self or small company employment category. See Table 8.8, p. 8-15.

A glance at the first job employment goals reveals that the majority of students at all institutions except Stanford plan to work for large companies. Stanford with the largest proportion of fathers employed by large companies has the smallest relative number of students with employment objective in this category. In view of the alleged anti-profit orientation of students graduating in the '70's it is interesting to note that a smaller proportion of students than fathers have government, educational, or non-profit agency orientations.

Table 8.7 Intended Fields of Specialization of Students Entering Five Graduate Management Programs

Response Category	Number of Respondents at Each School				
	Boston College	Amos Tuck	Sloan	SMU	Stanford
Intended Field of Specialization					
1) Managerial Information and Control-Accounting, Managerial Economics, Business Economics	3	8	3	5	4
2) Operations Management - Production Control Systems	5	3	4	1	0
3) Management Information Systems/Computer Science	3	4	23	5	0
4) Organization Studies - Applied Behavioral Science, Industrial Relations, Personnel	2	2	10	3	2
5) Operations Research - Mathematical Models, Industrial Dynamics	2	3	22	4	1
6) International Management	0	6	13	0	7
7) Marketing	16	14	10	4	4
8) Finance	3	33	13	12	12
9) General Management - Business Policy	16	22	7	23	19

Table 8.8 Employment-Related Responses of Students Entering Five Graduate Management Programs

Response Category	Boston College #	Boston College %	Amos Tuck #	Amos Tuck %	Sloan #	Sloan %	SMU #	SMU %	Stanford #	Stanford %
Father's Employment										
1) Government, education, non-profit agency	11	22	15	14	30	28	9	14	8	15
2) Self or small company	18	36	52	50	49	45	32	50	24	45
3) Large Company	13	26	35	33	24	22	16	25	19	35
4) Other	8	16	3	3	5	5	7	11	3	5
First Job Employment Goals										
1) Government, education, non-profit agency	5	10	11	10	15	14	3	5	7	13
2) Self or small company	19	38	41	40	36	33	28	45	28	51
3) Large company	25	50	51	50	52	48	32	50	20	36
4) Other	1	2	1	1	6	5	0	-	0	-

Examination of the detailed responses reveals that ten of the fifteen Sloans and six of the seven Stanford students with employment objectives in the government or non-profit category plan to work for government agencies.

The items specifically noted in this section are the only ones for which statistically different distributions were generated by students entering the five graduate management programs. It was impossible to distinguish among those attending the five schools based on responses to the following items.

- Has your mother worked full time for wages or salary since you were born?
- Describe your father's education.
- How many older brothers and sisters do you have?
- How many younger brothers and sisters do you have?
- Describe your undergraduate field of study. (Part b of Question 15 which includes "History, Political Sciences, Philosophy," etc.)
- How certain are you of your decision to enter this particular graduate school?
- Which of the following best describes the occupation of your father?

An earlier study directed by Dr. Paul D. Green at the Wharton School[1] demonstrated that student perceptions of institutions differed. However, the nature and causes of these perceived distinctions remained to be determined.

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[1] Gonzalez, S.M., Kaled, D.A., and Russo, J.P., "The Business School Image". MBA, October, 1967, pp. 30-32.

The study in question focused on the perceptions of students at six graduate schools of business; Carnegie Institute of Technology, Chicago, Harvard, M.I.T., Stanford and Wharton. Three student samples of fifty each rated the six schools using similarity triads, direct ratings and the semantic differential. The results indicate that:

> The primary criterion selected by most of the students in judging similarity was the relative degree of quantitativeness or qualitativeness implicit in a given school's curriculum.

The three 'typical' perceptual maps presented in the article use the qualitative - quantitative criterion as the major axis. These maps, reproduced in Figure 8.1 page 8-18 reveal that the three dimensions which the authors defined as Prestige, Quality of Instruction and Reputation all produce startlingly similar student positioning on the perceptual maps.

> Of particular interest - and surprise - to us was the low dimensionality of the perceptual maps. Apparently, most students use few criteria in characterizing business schools. Secondly, we were intrigued by the stability of the "image" through three different data collection methods. Finally, even when we attempted to disaggregate the data, the resulting perceptual maps were quite similar among the various subgroups of respondents.[1]

Differences in Expectations

As noted earlier in Chapter 5, four of the five expectations questions -- 22, 23, 24, and 29 -- were factor scored. Question 21 was omitted from the analysis.[2] The factor scores based on the four questions were combined in a single discriminant analysis designed to isolate differences among those entering the five graduate program. The results of this analysis are presented in the Centour of Group Centroids Matrix, Table 8.9 page 8-19 and the Centour Diagram, Figure 8.2 page 8-20. In this

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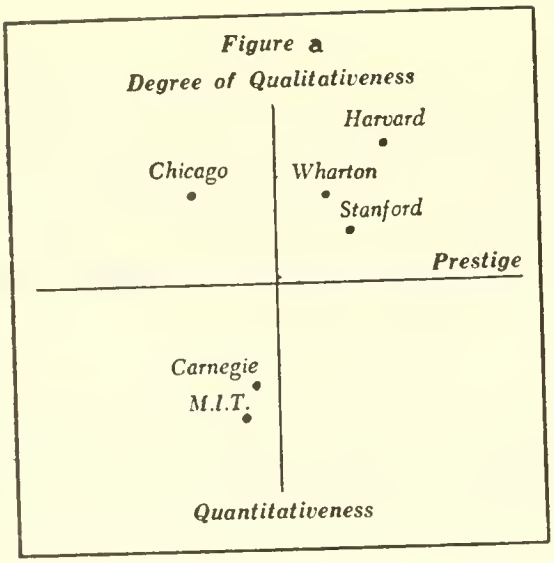
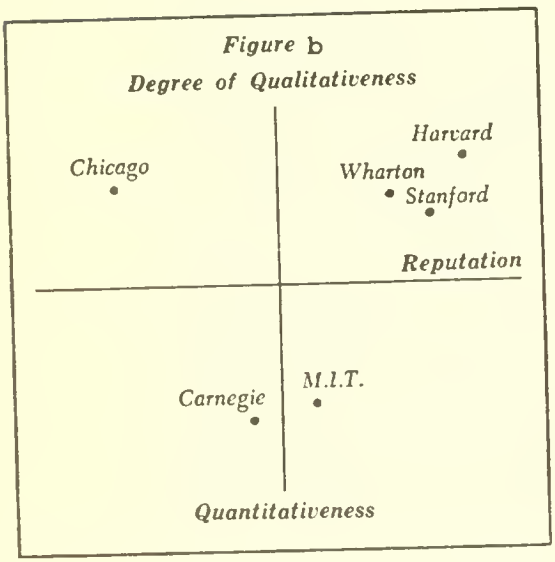
[1] Ibid., page 32.

[2] See "Reasons for Pursuing Graduate Study", Chapter 5.





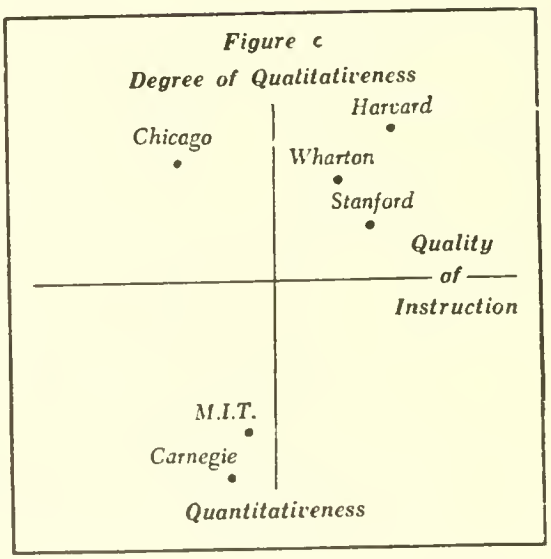
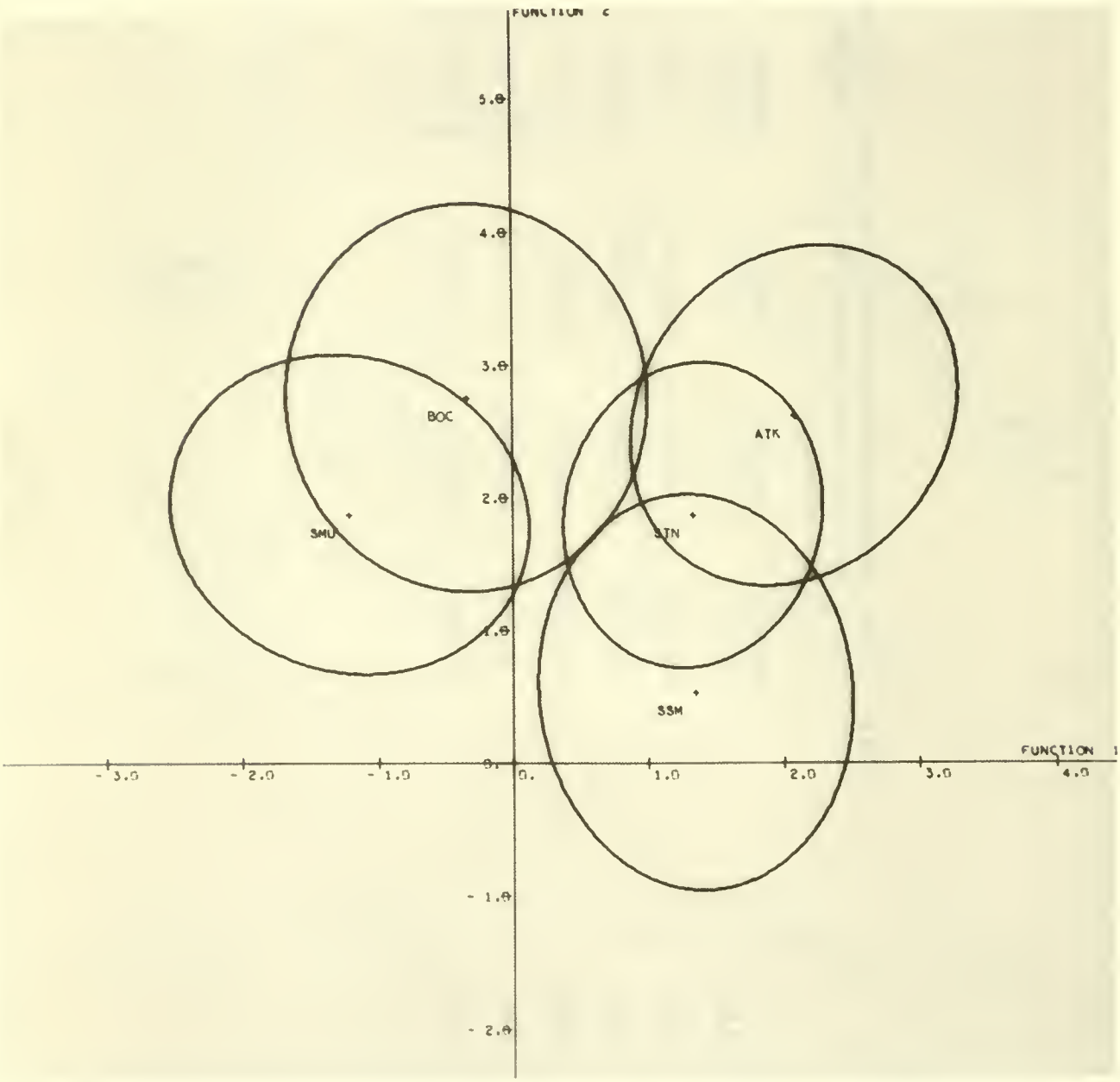


Figure 8.1 Perceptual Maps from Wharton Study

Table 8.9 Centours of Group Centroids Matrix for Students Entering Five Graduate Management Programs Based on Expectation Data

Variable	CENTROID ATK	CENTROID BOC	CENTROID SSM	CENTROID SMU	CENTROID STN
ATK	100.0000	13.6330	26.5900	2.6482	30.8313
BOC	10.1738	100.0000	11.6563	49.0990	8.7684
SSM	23.7720	13.2076	100.0000	8.1890	24.4783
SMU	2.4440	55.0900	3.7810	100.0000	2.4948
STN	33.9359	9.5115	26.9676	11.6178	100.0000

Figure 8.2 Centour Diagram for Expectations of Students Entering Five Graduate Management Programs: Discriminant Functions 1 and 2



and subsequent evaluations the five graduate school names will be abbreviated using the code structure: Amos Tuck (ATK), Boston College (BOC), Sloan School of Management (SSM), Southern Methodist University (SMU), and Stanford University (STN).[1]

The Centour of Group Centroids Matrix indicates substantial separation between S.M.U. and Amos Tuck as well as S.M.U. and the Sloan School of Management. A lesser but still significant separation between Boston College and Stanford University is also apparent.

The Centour Diagram reveals that Function 1 from the analysis separates Southern Methodist (and to a lesser degree Boston College) from Amos Tuck, Stanford and the Sloan School. Function 2 appears to isolate Boston College (and to a smaller extent Amos Tuck) from the Sloan School.

The discrimination achieved by Function 1 is most clearly attributable to three factors; size of school, school location, and emphasis placed on extra curricular activities. Amos Tuck students attach greater importance to size of school in their selection of Dartmouth, while those entering Boston College and S.M.U. place little importance on their school's size. On the other hand, location is particularly important to members of the Boston College and S.M.U. populations. Boston College and S.M.U. students have the lowest score on the outside activities factor assessing the relative importance attached to extra curricular and social activities, community projects, etc.

The discrimination achieved by Function 2 is largely attributable to two factors: academic specialization (quantitative emphasis, research opportunities, field of interest) and case studies. Those entering the Sloan School rank highest on the academic specialization factor while case studies are important to Amos Tuck and Boston College entrants. Students entering the Sloan School

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[1]Abbreviations for school names in parenthesis identify respective school groups in tables and figures.

and Stanford produce the highest scores on the factor focusing on student and faculty characteristics at the selected graduate school.

In view of the prime importance of items in Question 22 to this analysis it may be useful to review the Chapter 7 discussion of applicant expectations. The "level of assessment" analysis presented in that chapter indicated that Sloan, Stanford and Amos Tuck students emphasize "prestige" as a determining factor in their decision to apply to those schools while Boston College and S.M.U. applicants are concerned with "location."

Despite these differences in relative assessment both prestige and location are given high absolute ratings by those entering all five schools as indicated in Figure 8.3 which displays the range (+ --- +), mean (X), standard deviation (V), and skewness (S) of the responses at each school as well as the average for all graduate schools of business administration (GSBA). See p. 8-23.

Semantic Differential - Perception Items

In view of the large number of dimensions encompassed by the adjective pair descriptors of self, ideal self, and the typical manager it would be reasonable to assume that the factors based on these perception items would discriminate among the five graduate management school populations. This expectation was not realized.

Table 8.10 and Figure 8.4 contain the Centour of Group Centroids Matrix and Centour Diagram produced by the discriminant analysis of these data. Both indicate almost total homogeneity with extensive overlap among all groups. The slight separation of Stanford and Sloan School from Southern Methodist and Boston College created by Function 2 is not statistically significant.

See pages 8-24 and 8-25.

Personal Opinions

The personal opinion data from the Pre Term Questionnaire separate students entering Southern Methodist from those selecting the other four programs. However, as indicated by the Centour of Group Centroids Matrix in Table 8.11 page 8-26

Figure 8.3 Absolute Response Statistics for Location and Prestige As Selection Criteria of Students Entering Five Graduate Management Programs

Factor	School	Sample	Not Applicable 1.0 2.0 3.0 4.0 5.0 6.0 Applicable 7.0
Location	Sloan	111	+----------V----------X----------SV----+
	Stanford	55	+----------V--------X--------SV
	SMU	64	+----------V---------X-----S
	Amos Tuck	105	+----------V----------X----------SV--+
	Boston College	54	+----------V----------X----------S
	All GSBA	278	+----------V----------X----------S

Factor	School	Sample	Not Applicable 1.0 2.0 3.0 4.0 5.0 6.0 Applicable 7.0
Prestige	Sloan	111	+----------V----------X----------S
	Stanford	55	+----------V-------X-----S
	SMU	64	+----------V----------X----------V-S------+
	Amos Tuck	105	+----------V---------X---------S
	Boston College	54	+----------V----------X----------SV---------+
	All GSBA	278	+----------V----------X----------S-+

Table 8.10 Centours of Group Centroids Matrix for Students Entering Five Graduate Programs Based on Perception Data

Variable	CENTROID ATK	CENTROID BOC	CENTROID SSM	CENTROID SMU	CENTROID STN
ATK	100.0000	83.2069	94.7687	85.0760	94.2725
BOC	80.4508	100.0000	69.8710	90.3962	59.4671
SSM	95.5806	73.0552	100.0000	70.1795	88.4619
SMU	85.2853	93.4602	67.9295	100.0000	72.9305
STN	94.6943	66.3728	89.7175	70.5399	100.0000

Figure 8.4 Centour Diagram for Students Entering Five Graduate Management Programs Based on Semantic Differential Discriminant Functions 1 and 2

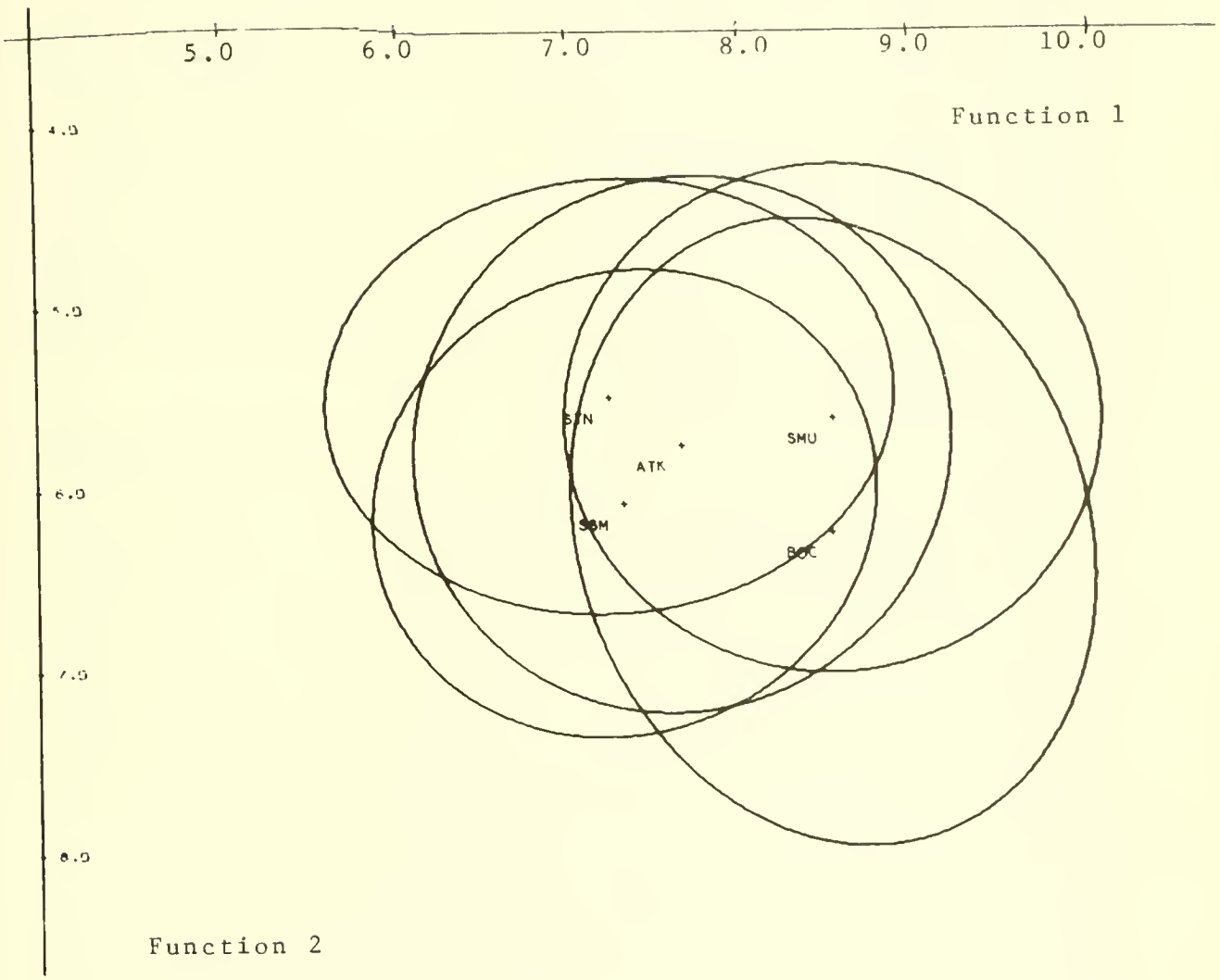

Table 8.11 Centours of Group Centroids Matrix For Students Entering Five Graduate Management Programs Based on Personal Opinion Data

Variable	CENTROID ATK	CENTROID BOC	CENTROID SSM	CENTROID SMU	CENTROID STN
ATK	100.0000	87.0394	79.6454	32.1779	90.8884
BOC	84.8975	100.0000	52.0064	35.1480	82.0018
SSM	71.8638	47.2624	100.0000	23.1337	67.8373
SMU	48.2494	38.8691	41.1415	100.0000	66.0107
STN	92.2778	83.0338	76.8473	59.7445	100.0000

and Centour Diagram in Figure 8.5 page 8-28 substantial overlap is present in all cases.

The strongest discrimination is clearly achieved by Function 1 with the Sloan School of Management and Southern Methodist occupying polar positions. Detailed data suggest that the S.M.U. isolation is based primarily on three issues. First, a more pro-union orientation; second, greater concern with the social responsibilities of management and organizations; and third, less emphasis on the importance of "knowing the right people" as a determinant of managerial success.

The opinions of students entering the Sloan School generally conflict with those of S.M.U. students in these three areas. Sloan students also exhibit greater cynicism regarding the fate of personal ethics in the managerial setting. This difference is particularly manifest in the Sloan student's agreement with the statement "the man who gets ahead in industry knows the right people."

Expectation Similarities

In view of the substantially different response distributions associated with questions 22, 23, 24 and 29 it may be useful to note certain cases in which complete or substantial agreement was maintained across all five graduate school populations. F and t tests of dispersion and means were used to test response consistency on each item of these question sets.

Two items produced total agreement with no measurable difference among the population groups. The first was unanimous disapproval of the assertion that graduate study might be justified on the basis that "you can't do anything interesting with a bachelor's degree."[1] The second was unanimous agreement on a learning outcome dimension -- expected change in ability to make decisions. Both F and t tests failed to detect significant differences between any two population groups or any individual school and the population as a whole.

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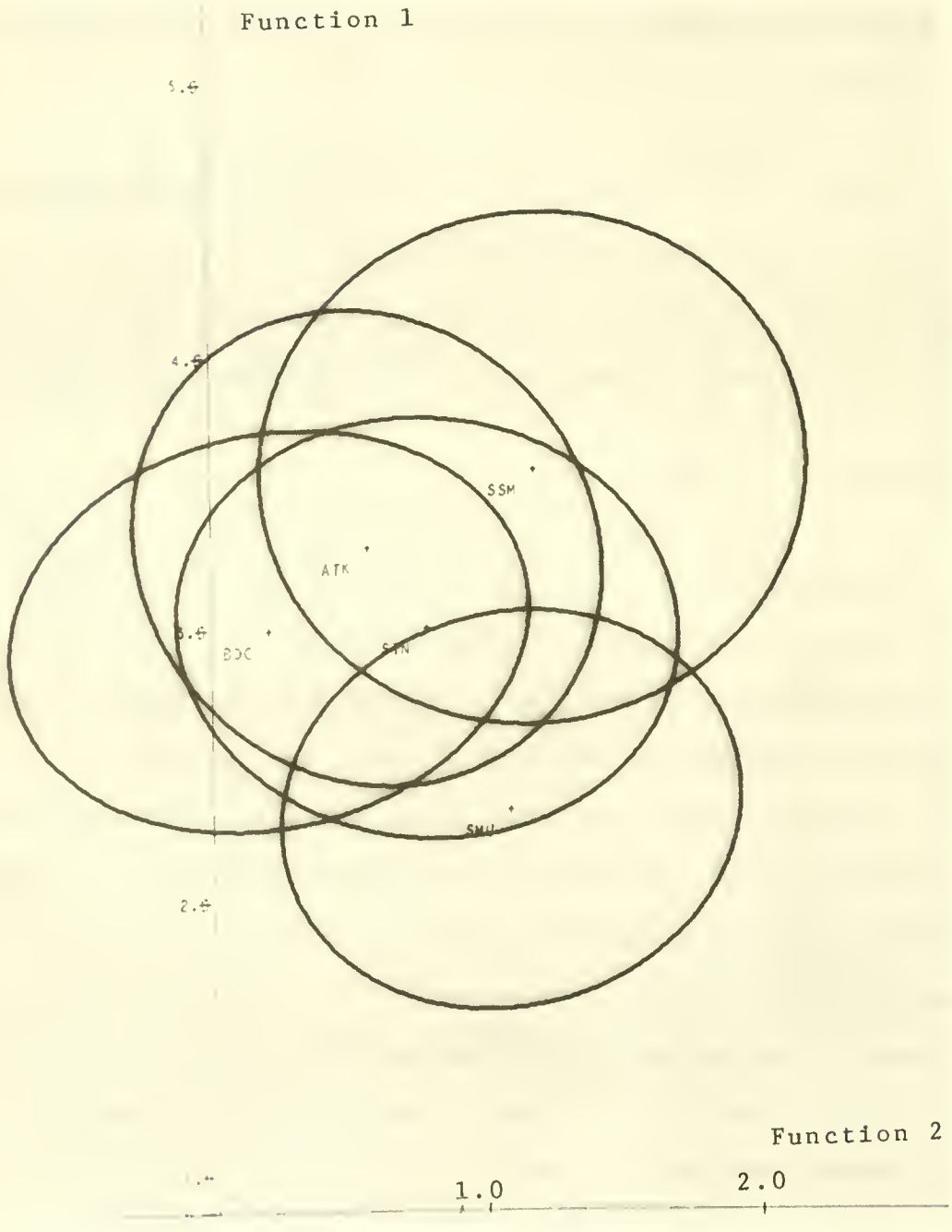
[1]This item is part of Question 21 which was omitted in prior analyses. It is included here only to demonstrate the complete lack of between group discrimination achieved by the question set.

Figure 8.5 Centour Diagram Based on Personal Opinions of Students Entering Five Graduate Management Programs: Discriminant Functions 1 and 2



Responses on these two items are summarized in Figure 8.6 using the previously established report generator conventions. See page 8-30.

Analysis of many items showed four of the five distributions to be statistically equivalent with the fifth deviating slightly from the norm. In many instances the deviation is so slight that visual examination of the distributions leads to the conclusion that no significant difference exists. However, the F or t test indicates that the null hypothesis that all groups can be considered samples from a single larger population must be rejected. Figure 8.7 illustrates one such case involving entering student responses regarding expected change in ability to sell ideas to others (a learning outcome dimension in question 24). The single deviation from homogeneity is the difference in dispersion of Sloan and Amos Tuck responses. The F test between the two samples is significant at the .05 level. See page 8-31.

Similar near perfect agreement is encountered in responses to the eleven expectation items summarized in Table 8.12. This summary of the "single deviate" cases indicates the mean and standard deviation statistics for the combined sample and the deviate as well as the F or t test significance of the deviation. In performing this analysis the F test of variance was first examined to determine whether there was a significant difference at the .01 or .05 level. If the F test failed, the t test of the mean was performed. The entry in the right most column of Table 8.12 indicates the highest significant test in this sequence. See page 8-32 for Table 8.12.

Faculty Expectations in Five Graduate Management Programs

Now that the characteristics of students entering the five graduate schools have been established it is appropriate to examine the other end of the edu-

Figure 8.6 Comparisons of Entering Graduate Student Responses On Two Items Producing Statistically Equivalent Response Distributions

POSSIBLE MOTIVATIONS FOR PURSUING GRADUATE STUDY

Can't Do Anything Interesting With B.A.

School	Sample	Not Applicable 1.0	2.0	3.0	4.0	5.0	6.0	Applicable 7.0
Sloan	111	S-V	X		V			
Stanford	55	S V	X		V			
SMU	64	SV	X		V			
Amos Tuck	105	S V	X		V			
Boston College	54	SV	X		V			
All GSBA	278	S-V	X		V			

AMOUNT OF CHANGE IN ABILITY TO MAKE DECISIONS YOU EXPECT TO TAKE PLACE AS A RESULT OF YOUR PRESENT STUDIES

School	Sample	No Change 1.0	2.0	3.0	4.0	5.0	6.0	Much Change 7.0
Sloan	111		V		X		S-V	
Stanford	55		V		X	S	V	
SMU	64		V		X		S-V	
Amos Tuck	105		V		X		S-V	
Boston College	54		V		X		SV	
All GSBA	278		V		X		S-V	

Figure 8.7 Example of Response Distributions on Items for Which One School Differed at .05 Significance Level

AMOUNT OF CHANGE IN ABILITY TO SELL IDEAS TO OTHERS YOU EXPECT TO TAKE PLACE AS A RESULT OF YOUR PRESENT STUDIES

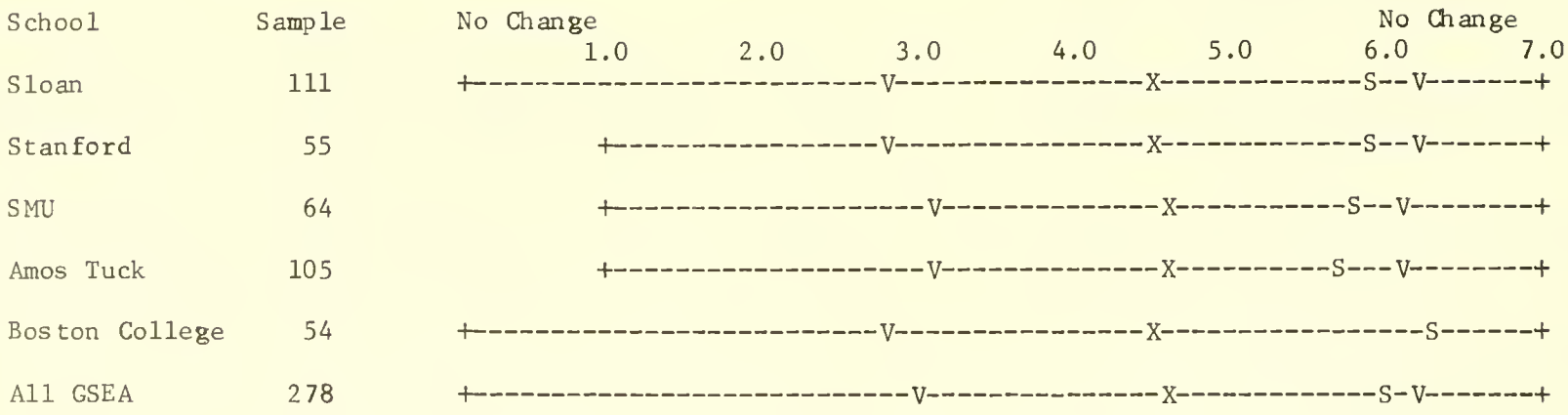


Table 8.12 Summary of "Single Deviate" Cases
From Responses to Expectation Questions

Question #	Item Descriptions	Combined Sample $\bar{X}$	Combined Sample σ	"Single Deviate" School
21. Reasons for Pursuing a Graduate Degree	My family would be pleased	2.1	1.7	SMU σ 2.1 and Sloan σ 1.6 (F.01) and Stanford σ 1.5 (F.05) and Amos Tuck σ 1.7 (F.05) and Boston College σ 1.6 (F.05)
	Desire skills to become expert in field	5.5	1.6	Boston College σ 2.1 and Sloan σ 1.5 (F.01) and Stanford σ 1.5 (F.05) and SMU σ 1.4 (F.01) and Amos Tuck σ 1.6 (F.05)
	Graduate Study will be an important part of my career	4.8	1.7	Boston College σ 2.0 and Sloan σ 1.6 (F.05) and Stanford σ 1.5 (F.05) and Amos Tuck σ 1.7 (F.05)
23. Activities which will contribute to career objectives	Course lectures	4.9	1.3	Stanford σ 1.0 and SMU σ 1.4 (F.05)
	Course reading preparation	4.9	1.3	Stanford σ 1.0 and all other schools σ 1.4 (F.05)
24. Expected change in Managerial skills	Ability to induce change	4.5	1.6	Amos Tuck σ 1.4 and Sloan σ 1.7 (F.05)
	Ability to identify problems	4.8	1.6	Amos Tuck $\bar{X}$ 5.0 and Sloan $\bar{X}$ 4.4 (t.05)
	Ability to work with people	3.7	1.8	Boston College σ 2.0 and Amos Tuck σ 1.7 (F.05)
	Recognize own abilities and limitations	4.1	1.8	Amos Tuck σ 1.6 and Sloan σ 7.0 (F.05) Amos Tuck $\bar{X}$ 4.5 and Stanford $\bar{X}$ 3.9 (t.05) and SMU $\bar{X}$ 3.9 (t.05)
	Attitudes toward people	3.5	1.7	Boston College $\bar{X}$ 3.9 and Sloan $\bar{X}$ 3.2 (t.05) and Amos Tuck $\bar{X}$ 3.2 (t.05)
	Goals and Aspirations for career	4.2	1.9	Boston College σ 2.2 and SMU σ 1.7 (F.05) and Amos Tuck σ 1.8 (F.05)

cational dipole -- the faculty members responsible for the courses these students will take.

As noted in Chapter 5 the first question is, what are the appropriate descriptors of a faculty member? Traditional specifiers include academic degrees, field(s) of concentration, publications, professional society memberships, honors, and professional activities. While interesting, these indicators provide a rather shallow basis for assessing the faculty's role in the educational interaction.

The administrator approaching this issue is most apt to be concerned with the impact of faculty resources allocated to particular courses. The researcher is appropriately interested in the process -- the forces at work in the classroom. Our current focus is on the plans and expectations with which the faculty member enters this interaction. What does he plan to do in "his course?" What are his objectives? How does he believe that the course will affect his students? Which learning mechanisms does he intend to employ to achieve what objective? How does he view his course in relation to the program as a whole -- what are its underlying disciplines, reference frameworks, and conceptual organization?

The Professor Pre Course Questionnaire is designed to acquire this type of data. While this approach to faculty assessment is plagued with the many problems discussed in Chapter 4, discussions with faculty members and administrators at the schools studied give us reasonable confidence that the items incorporated in this questionnaire encompass the bases for a major portion of classroom activities. Nevertheless, the categories employed are applicable only to management programs. And, even with this limited orientation, they may be inadequate to describe the more specialized management courses. It is important to recognize that we have not attempted to create a generalized measurement scheme. Our objective is simply to demonstrate that it is possible to measure the inputs to a narrowly defined segment of the academic process.

We contend that the approach, but not the measures, have broad applicability.

The data base used for this analysis encompasses a cross section of the Master's courses offered at the Sloan School, Boston College, S.M.U., and Amos Tuck (33, 30, 25, and 18 respectively). Data covering nine courses from the Stanford graduate program are also included.

Differences Among Faculty Pre Course Expectations at the Five Schools

Data obtained from the Sloan School were factor analyzed using the procedures described in Chapter 5. The resulting factor structure was then used to score data from all five schools and the ensuing scores were subjected to discriminant analysis.

You may recall from the Chapter 5 discussion that the factors produced by this analysis were relatively difficult to interpret and that factor 1 was particularly perplexing.[1] Interpretation of the discriminant analysis is greatly simplified by response consistency among the five schools on the dimension established by factor 1.

The discriminant analysis of the factor-scored faculty data is summarized in the Centour of Group Centroids Matrix (Table 8.13 page 8-35) and the Centour Diagram in Figure 8.8 page 8-36. The analysis establishes three groupings consisting of: (1) Southern Methodist, (2) Amos Tuck and (3) Boston College, Sloan School of Management and Stanford. The Centour Diagram reveals that SMU is separated from the other schools by Function 1 while Function 2 isolates Amos Tuck.

Stanford and Southern Methodist fall at the opposite ends of the function 1 dimension while Amos Tuck and the Sloan School occupy polar positions on the dimensions defined by Function 2.

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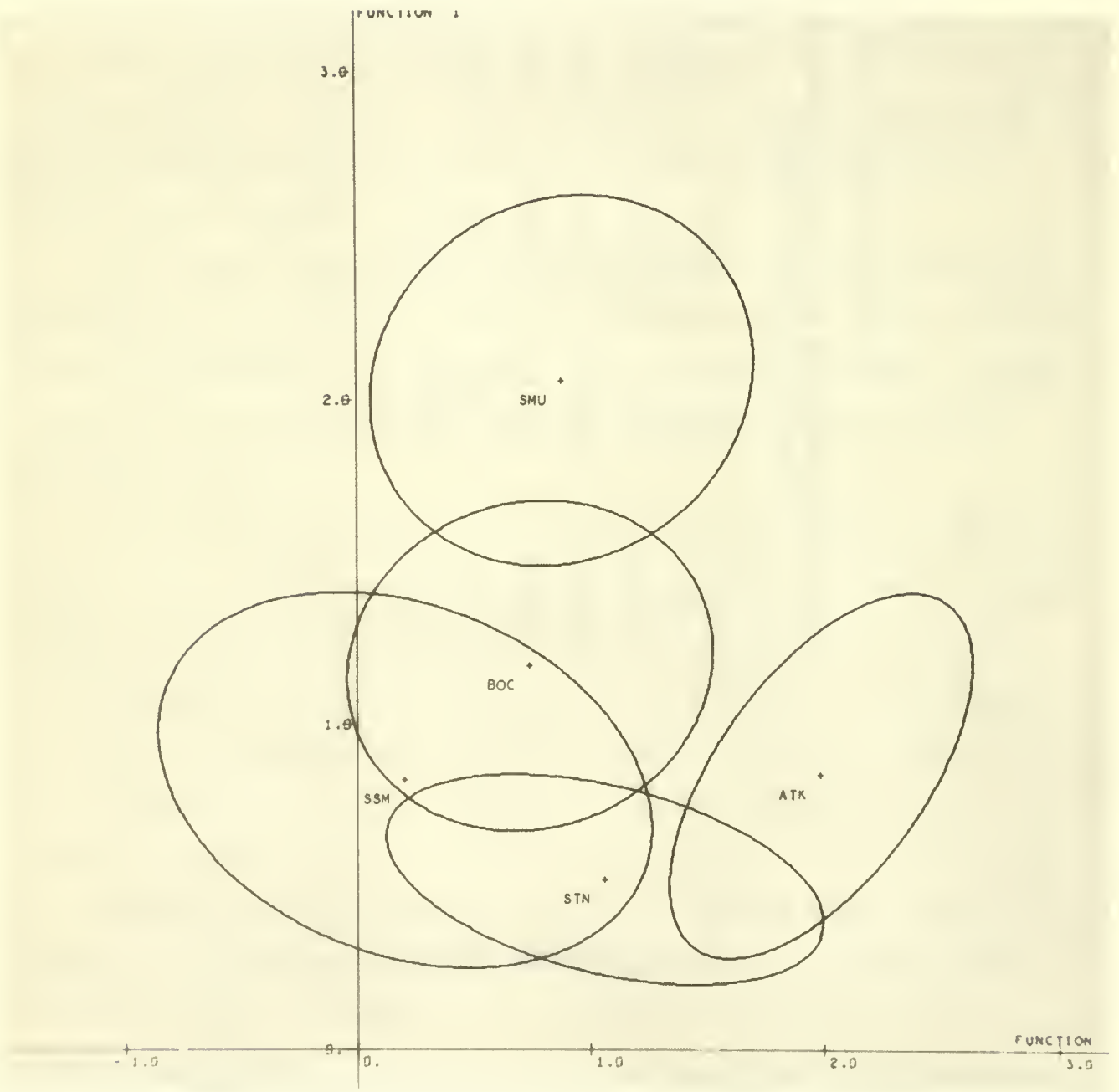
[1] See Chapter 5 pages 5-93 to 5-100.

Table 8.13 Centours of Group Centroids

Matrix Based on Faculty Pre Course Expectations at Five Graduate Business Schools

Variable	Centroid BOC	Centroid ATK	Centroid SSM	Centroid SMU	Centroid STN
BOC	100.0000	1.3268	65.5238	30.7044	10.9515
ATK	20.6179	100.0000	21.7910	2.8754	19.2774
SSM	64.6842	0.2651	100.0000	8.2962	54.1606
SMU	22.7765	0.0071	4.8869	100.0000	0.0002
STN	37.9883	33.5881	68.2969	2.3340	100.0000

Figure 8.8 Centour Diagram of Faculty Pre Course Data at Five Graduate Business Schools Based on Discriminant Functions 1 and 2



The S.M.U./Stanford separation achieved by function 1 involves five factors: "student assignments", "marketing", "personality development", "information and control applications", and "local government orientation." S.M.U. professors emphasize elements of the "student assignment" factor which consists of projects in industry, short papers based on course material, and activities designed to induce change. They also score higher on the "marketing" factor stressing capital sources, psychology, consumers and marketing functions. The S.M.U. faculty also place greater emphasis on state and local government and community organizations.

Stanford faculty members generally exhibit little interest in the course elements emphasized by S.M.U. instructors and attribute greater importance to items associated with student personality development (career objectives, change in personal attitudes and values, and self confidence). They also exhibit the least interest in the application of information and control technology and are positioned at the low end of the marketing factor. While the responses obtained from Stanford faculty members established this contrasting position it is important to remember that the data examined in this analysis relate to only nine Stanford courses while broader and more representative samples were obtained at all other schools.

The separation of Amos Tuck by Function 2 is largely attributable to faculty emphasis on student learning mechanisms in the classroom, visiting lecturers, class lectures, simulated epxeriences and class discussions (the Classroom Oriented Learning factor), as well as the factor reflecting emphasis on qualitative material and student interaction outside of class, (the Qualitative Approach factor).[1] The Stanford faculty also emphasized the Qualitative factor.

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[1]Composition of factors is given in Chapter 5.

Members of the Amos Tuck faculty attach little importance to the local groups factor, "Governmental Process Theory", which is emphasized by Southern Methodist instructors. They also join the Stanford faculty in placing low emphasis on items associated with the Industrial Relations factor.

These results from the discriminant analysis of factor scored Professor Pre Course data are less than totally edifying. Although there are significant differences among the five faculty groups, the results of the analysis defy simple summation. In the absence of a clearly evident underlying structure it is natural to question whether the apparent differences are "real" and managerially actionable or merely a mathematical apparition. One way of testing the validity of the apparent relationship is to evaluate the data using another technique to see if the same structure emerges. Prediction of group membership based on chi square analysis offers an interesting alternative in this context.

The basic idea of chi square classification is to compare the responses for a particular course to the average responses for all courses in each school. The course is then assigned to the school where the best match occurs.

Table 8.14 summarizes the results obtained when each course included in this study was assigned to the graduate school whose average Pre Course profile best matched the Pre Course response distribution generated by the instructor in charge. The columns in Table 8.14 indicate the actual group membership while the rows contain the predicted association. Thus the third entry in the first column indicates that twelve of the courses actually given at Boston College were assigned to the Sloan School group by the chi square procedure. It is interesting to note that this overlap parallels that previously noted in the Figure 8.8 Centour Diagram. The Stanford/Sloan commonality is also reproduced. (See Table 8.14 page 8-39)

Table 8.14 X^2 Prediction of Group Membership for Courses At Five Graduate Business Schools Based on Fall 1969 Professor Pre-Course Data

Predicted Group Membership	Actual Group Membership				
	Boston College	Amos Tuck	Sloan	SMU	Stanford
Boston College	8	0	4	1	1
Amos Tuck	4	10	1	0	1
Sloan	12	1	21	3	4
SMU	4	1	1	21	0
Stanford	2	6	6	0	3
	30	18	33	25	9

Southern Methodist, Amos Tuck, and the Sloan School emerged from the discriminant analysis as clearly distinct entities while Boston College and Stanford occupied the Sloan/S.M.U. and Sloan/Amos Tuck midground. The chi square classification analysis duplicates this condition. S.M.U., Sloan, and Amos Tuck have the largest proportion of correctly classified courses (84%, 63%, and 55% respectively). Boston College and Stanford exhibit the largest proportion of incorrect classifications (73% and 67% respectively). The largest number of both Boston College and Stanford courses are incorrectly assigned to the Sloan School. An equal number of Boston College courses are erroneously assigned to Amos Tuck and S.M.U.

While filing the previously noted demurrer based on the small Stanford sample, this analysis substantiates our previous conclusion regarding the consistency of faculty intentions at the five institutions.

Differences Among Student and Faculty Expectations

The discussion thus far has been concerned with differences among the student and faculty groups entering the five graduate managment programs. While these cross-school comparisons are useful in establishing the inputs to the various programs we are also concerned with the process occurring within each school. In this context it is appropriate to consider the compatability of student and faculty expectations within each of the institutions studied.

The following analysis of this phenomenon will focus on data from the Sloan School. This emphasis is based on two considerations. First, Pre-Course data were obtained from the largest number and proportion of courses at Sloan. Secondly, Sloan faculty expectations were among the most internally consistent encountered.

The Professor Pre Course and Student Pre Term expectation data required for this analysis are naturally linked to the student and Professor Post Course data obtained at the end of each term. Analytic considerations dictated that data from these sources should be considered together in a single analysis. Therefore data from all four sources will be presented although this chapter is primarily concerned with student and faculty Pre Course responses.

Both the student and faculty questionnaires ask about expected (or intended) learning mechanisms as well as expected course impact measured in terms of change in student managerial skills. These two concepts will be treated separately beginning with the learning outcome expectations.

Student and Faculty Learning Outcome Expectations

The faculty Pre Course questionnaire asked instructors, "As a result of this course, to what extent do you expect to develop the student's experience in ..., develop the student's awareness of ..., and bring about change in ... ." The same questions (worded in the past tense) were repeated at the end of the term.

The student Pre Term questionnaire asked for the entering student's assessment along these same dimensions, "Indicate the amount of change in yourself that you expect to take place this year as a result of your present studies." These questions were repeated in the end of semester course evaluation which asked students to "Indicate the amount of change in yourself that took place as a specific result of this course."

The faculty before and after measurement is relatively straightforward since directly parallel instruments are used. The student situation is slightly more complicated since the Pre Term questionnaires are not course specific.

During the pre test phase of this research individual student pre course

questionnaires were employed. Analysis of response from these instruments revealed that entering students have few course specific expectations. Their hopes (and fears) apply equally to all segments of the program. Requests for course specific discrimination produce frustration, anxiety, or worse.

Data available at the beginning of the term therefore permit comparisons between student expectations for the program as a whole and the composite faculty expectations for courses making up the program. At the conclusion of each semester the individual faculty member's perception of developments in a particular course may be compared to the composite perception of the students participating in the course. At the same time the composite post course perceptions of all faculty members can be compared to the composite student perception across all courses.

The four inputs to this analysis are thus: the combined student expectations measured by the Pre Term questionnaire; the combined faculty expectations obtained through the Pre Course questionnaire; the combined student course outcome expectations measured by the Course Evaluation questionnaire; and the combined faculty perceptions reported in the Professor Post Course questionnaire.

All four data sets were factor scored and compared using the discriminant analysis technique. The results of this analysis are summarized in the Centour of Group Centroids Matrix, Table 8.15 page 8-43 and in the two Centour Diagrams based on Functions 1 and 2 in Figure 8.9 page 8-44 and Functions 1 and 3 in Figure 8.10 page 8-45.

The Centours of Group Centroids Matrix indicates very little overlap between student Pre Term expectations and Professor Pre Term and Post Course perceptions. Student post course perceptions have moved in the direction of Professor Pre Course expectations and marginally closer to professor Post Course perceptions. However, a substantial disparity remains.

Clearly there is a discrepancy between the expectations of students entering the Sloan School of Management and the professors preparing to

Table 8.15 Centours of Group Centroids

Matrix for Professor and Student Learning Outcome Expectations at the Sloan School of Management

	Variable	Cenroid Prof. Pre	Centroid Prof. Post	Centroid Stu.Pre	Centroid Stu. Post
Group Number 1	Professor Pre-Course	100.0000	50.7864	1.9161	11.1321
Group Number 2	Professor Post Course	60.5723	100.0000	2.3708	13.2944
Group Number 3	Student Pre-Term	11.7111	8.3073	100.0000	19.5509
Group Number 4	Student Post-Course	27.5012	24.0894	31.3113	100.0000

Figure 8.9 Centour Diagram for Professor and Student Learning Outcome Expectations and Perceptions at the Sloan School of Management; Discriminant Functions 1 and 2.

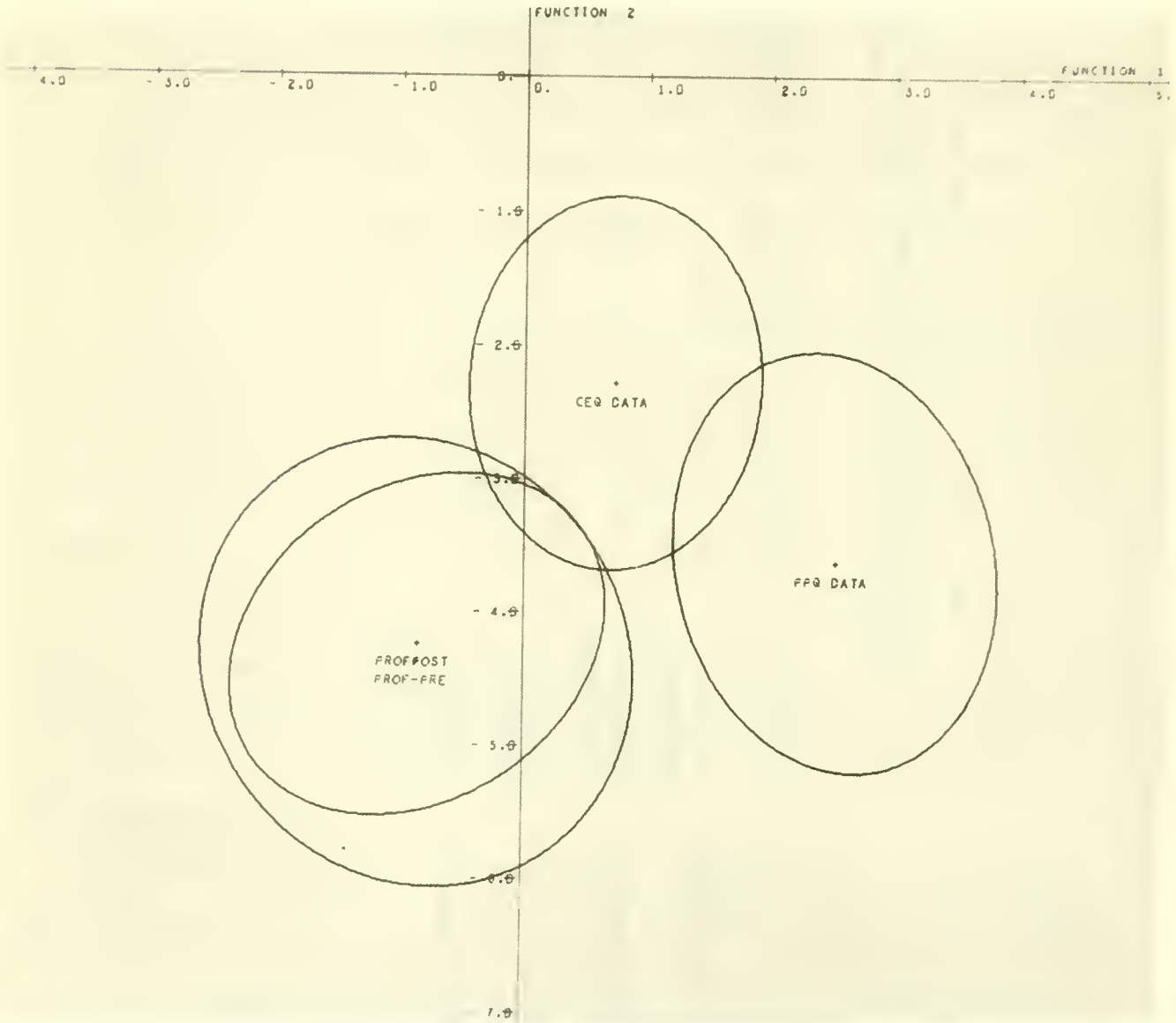
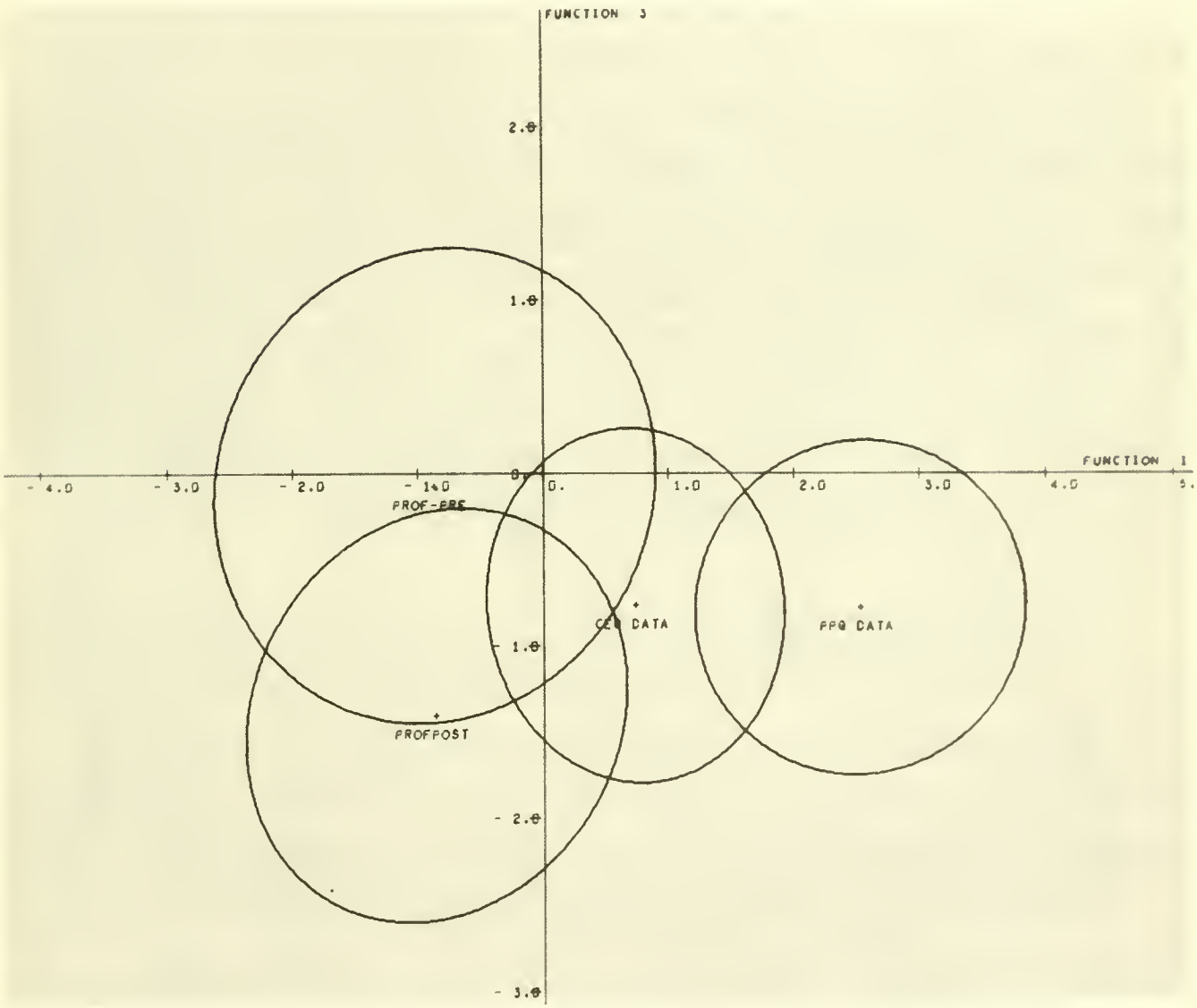


Figure 8.10 Centour Diagram for Professor and Student Learning Outcome Expectations and Perceptions at the Sloan School of Management; Discriminant Functions 1 and 3.



teach the courses in which they will participate. The summary of group means[1] reveals an interesting consistency in the difference between the Pre Term and Post Course student data. There is a downward shift along all dimensions from the student Pre Term expectation to Post Course perception. It may be argued that this phenomenon is due to the fact that Pre Term expectations refer to change expected as a result of the entire year's program while the Post Course evaluation references experience in a particular course during a single term. However it is surprising to encounter this condition on all dimensions.

The student-faculty discrepancy is largely attributable to differences on seven dimensions. The faculty had greater expectations in terms of course impact on student creative thinking and problem solving ability. Student expectations exceeded those of the faculty with respect to emphasis on policy formulation, communicating ideas, selling ideas, inducing change and self confidence. Interestingly, student perceptions of actual course impact along all five dimensions are substantially lower than their Pre Term expectations and in most cases, equal to or lower than the faculty expectations and perceptions.

The Centour Diagrams illustrated in Figure 8.9 and 8.10 show that Function 1 separates pre and post course student responses from those of the professors; Function 2 isolates student post course perceptions from student pre course expectations and both faculty responses; while Function 3 separates professor pre course expectations from their post course perceptions.

The discrimination achieved by Function 1 is largely explained by the emphasis placed on policy formulation, selling ideas, and inducing change. Student Pre Term expectations emphasize these learning outcomes. But, by the

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[1] A summary of group means is included as one step in the discriminant analysis output.

end of the first term students report relatively little change along these dimensions and the faculty consistently attaches little or no importance to them.

Function 2 isolates the emphasis placed upon application of techniques, creative thinking, communicating, doing research, and personal attitudes and values. At the conclusion of the first term students report greater than expected (Pre Term) emphasis on application of techniques and less than the expected (Pre Term) emphasis upon creative thinking, communicating, doing research, and changes in personal attitudes and values.

Function 3 explains only .054% of the total variation. However, it does account for the only discernable difference between faculty Pre and Post Course responses. The discriminatory power of this function is based largely on three variables: problem solving, career objectives, and attitudes toward people. Interestingly, the Pre Course emphasis on each of these learning outcomes was less than the Post Course assessment of perceived change. In contrast, student Pre Term expectations and Post course perceptions associated with these dimensions remained constant.

Figure 8.11 presents the Centour Diagram created by Functions 2 and 3 illustrating the relative position of the four groups on the plane defined by these two functions and verifying the relative positioning established by the preceding two figures. See Figure 8.11 page 8-48.

The predicted group membership achieved when the chi square assignment technique is applied to data from the four groups is summarized in Table 8.16 p.8-49 This procedure confirms the previously established faculty-student dichotomy. In addition, a majority of three of the four groups (Professor Pre Course, student Pre Term, and student post course Course Evaluation) are assigned to the correct classification. Fifty percent of the professor Post Course assessments are in-

Figure 8.11 Centour Diagram for Professor and Student Learning Outcome Expectations and Perceptions at the Sloan School of Management; Discriminant Functions 2 and 3.

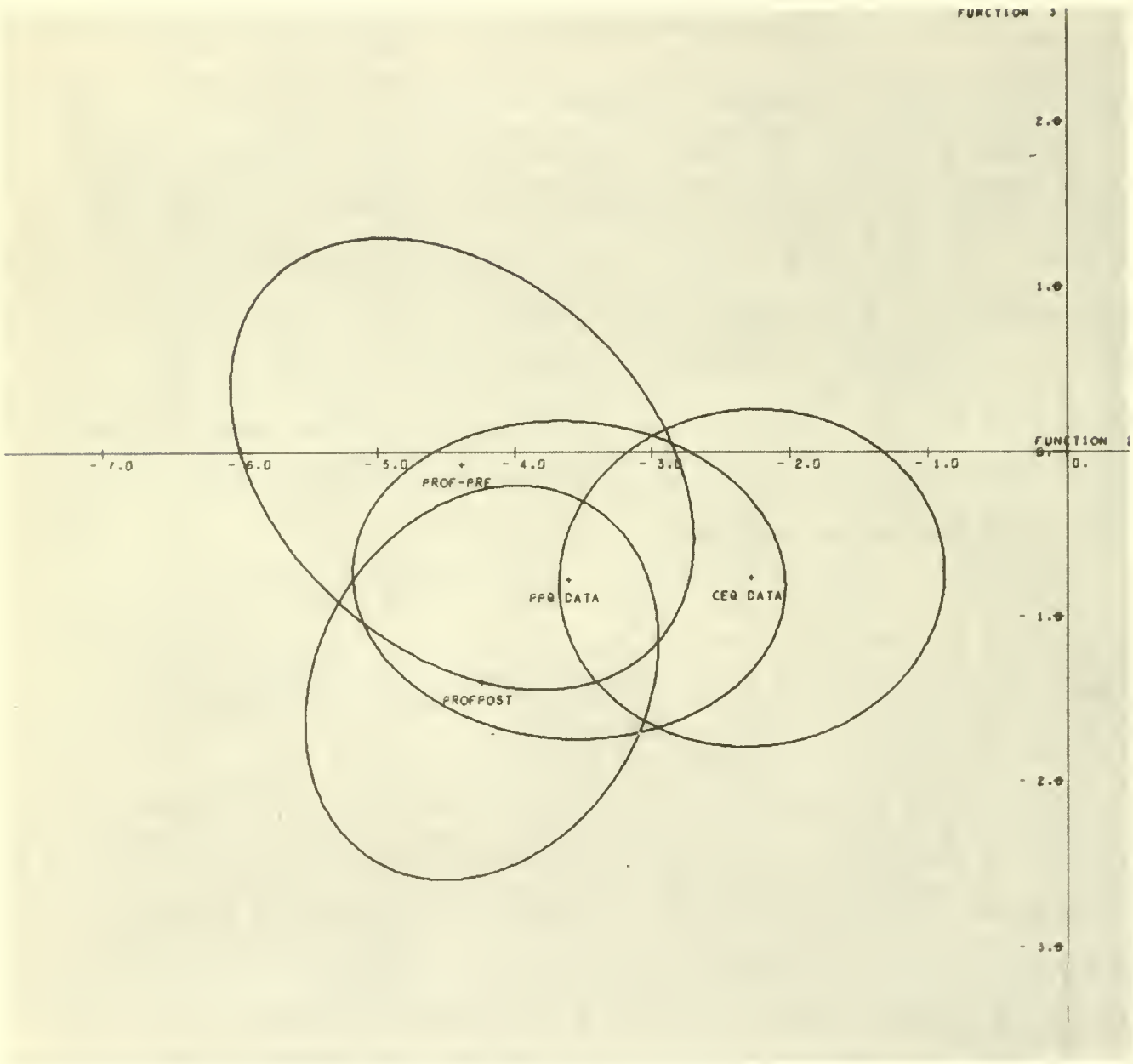


Table 8.16 X^2 Prediction of Group Membership
Four Professor and Student Pre and Post Course
Learning Outcome Perceptions

Predicted Group Membership	Actual Group Membership: Professor Pre-Course	Professor Post Course	Student Pre-Term	Student Post Course
Professor Pre	20	13	11	58
Professsor Post	5	18	1	29
Student Pre	3	2	83	66
Student Post	3	3	16	218

correctly classified with the majority of misclassifications erroneously identified as Professor Pre Course expectations. Student post course movement in the direction of professor Pre Course expectations is again noted with approximately 16% of the post course response sets classified as Professor Pre Course expectations. These two supporting analyses substantiate the existence of distinct differences between student and faculty expectations regarding program impact on student change. The faculty tends to emphasize more academic "creative thinking" and "problem solving" expectations while the students emphasize the more managerial or action oriented items such as policy formulation, selling ideas, inducing change, and improving self confidence.

These data suggest that both student and faculty expectations change as a result of classroom interaction. Post Course faculty perceptions have moved slightly in the direction of student Pre Term expectations while student Post Course evaluations have moved away from their initial expectations in the direction of initially stated faculty objectives. These change measures will be considered in more detail in later chapters. Our current concern is with the perceptions of entering students and we have yet to consider the learning mechanism, as opposed to learning outcome, expectations.

Student and Faculty Learning Mechanisms Expectations

The learning outcome expectations discussed in the previous section of this chapter represent one set of dimensions along which student and faculty perceptions were assessed. A second group of measures focused on expectations regarding the nature of the educational interaction in which they would participate -- characteristics of the teaching environment, pedagogical techniques and educational methods that would contribute to the learning experience. Student expectations regarding these learning mechanisms were assessed in the Pre-Term questionnaire. Faculty expectations and after-the-fact perceptions

were obtained through the Pre and Post Course faculty questionnaires, respectively. Student post course perceptions were evaluated within a more elaborately structured item set incorporated in the Course Evaluation questionnaires. (This question set describing the classroom environment, does not match the learning mechanism measures described above.)

Our current interest is in differences between faculty Pre Course and student Pre Term expectations. The professor Post Course assessments of actual developments during the term will also be examined to determine whether changes, if any, are in the direction of student expectations.

Both student and faculty expectations were measured on a 7 point scale. Students were asked to "Please indicate on the 7 point scale your expectations as to how each of the following activities will contribute to your career objectives." Faculty members were requested to "Please indicate on the 7 point scale the relative emphasis you plan to give the following learning mechanisms on both Pre Course and Post Course questionnaires ..."

Nine learning mechanism variables are common to all three questionnaire sets: independent research papers, projects in industry, visiting lecturers, student interaction outside class, class discussions, student interaction with people from industry, class lectures, student-faculty interaction, and group projects.

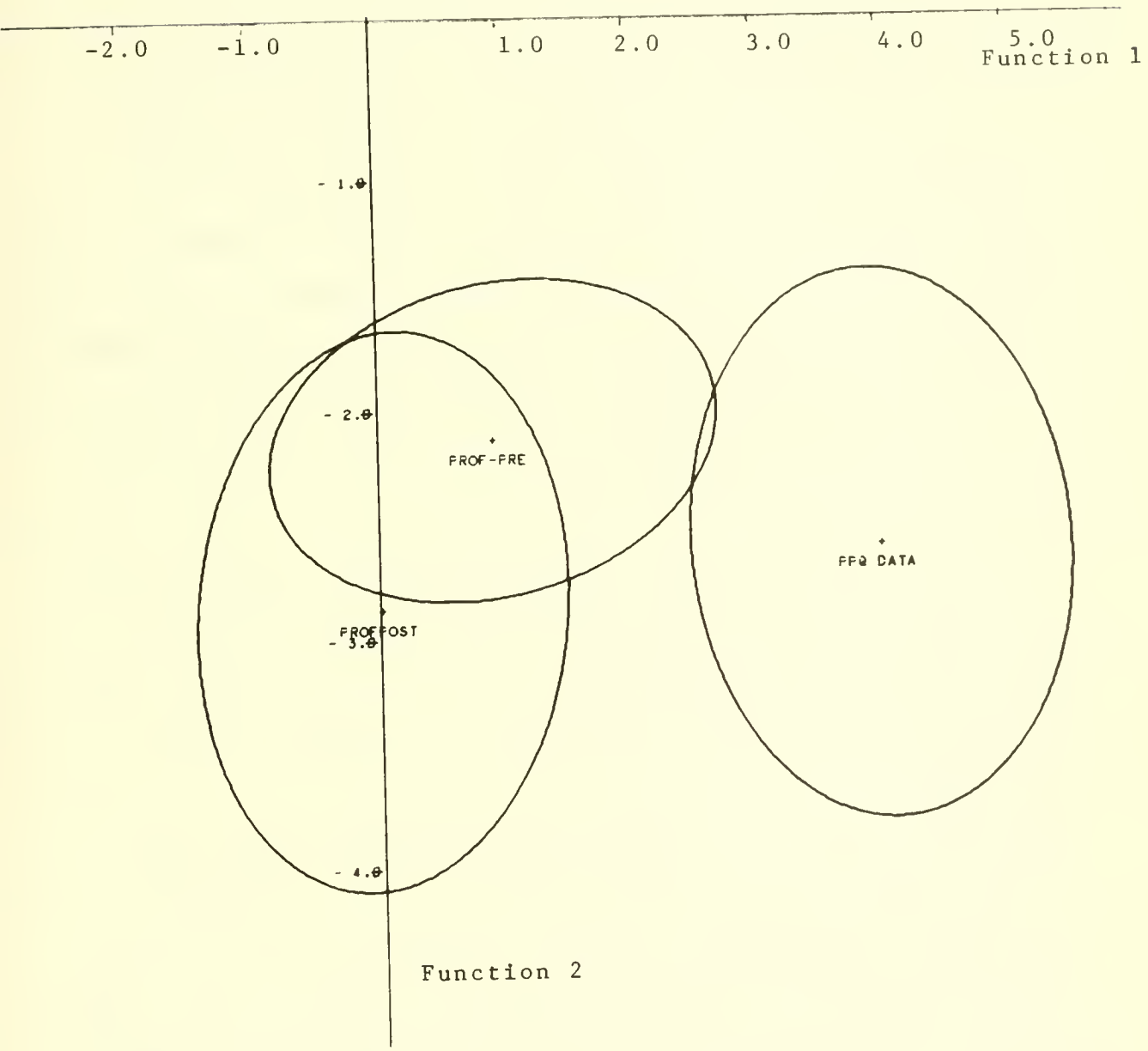
Table 8.17 page 8-52 and Figure 8.12 page 8-53 contain the Centours of Group Centroids Matrix and Centour Diagram derived from the analysis of these data. Both displays indicate that student and faculty entered the classroom with very different expectations regarding the learning experience which they were to share. Data from the Centour of Group Centroids Matrix suggests that the situation may have deteriorated rather than improved. Student and faculty Pre Term expectations overlap 12.4 to 13.8 while student Pre Term and faculty Post Term assessments had only a 3.0 overlap. It is obvious that faculty perceptions are relatively stable. Pre Course expectations and Post Course perceptions overlap 54.7 and 71.3. Comparable stability for the student popu-

Table 8.17 Centours of Group Centroids

Matrix Based on Student and Faculty Learning Mechanism Expectations
At the Sloan School of Management

	Variable	Centroid Group 1	Centroid Group 2	Centroid Group 3
Group Number 1	Professor Pre	100.0000	71.2968	12.3813
Group Number 2	Professor Post	54.6785	100.0000	3.0289
Group Number 3	PPQ Data	13.7602	2.6898	100.0000

Figure 8.12 Centour Diagram of Student and Faculty Pre Term Learning Mechanism Expectations and Faculty Post Course Perceptions at the Sloan School of Management, Discriminant functions 1 and 2.



lation would lead to significant disappointment. There is, however, some evidence of faculty change or at least a suggestion that the mechanisms actually used in the classroom were different from those contemplated at the beginning of the term.

As in the learning outcome's case the student Pre Term data apply to the program as a whole and are not course specific. It might, therefore be argued that student expectations should be higher than the faculty expectations for a single course during one semester. Although this argument might be validly applied to the learning outcome measures of expected change it is more difficult to maintain that learning mechanism expectation should be different for the program as a whole than for a semester within the program. Students clearly value certain types of educational experience believing that particular activities will contribute most directly to career objectives. We would expect this value judgement to be applied equally to courses encountered in all four semesters.

The inevitable conclusion is that students entering the Sloan School have "unrealistic expectations" regarding the educational program in which they will participate. The Centour Diagram based on Functions 1 and 2 derived from the discriminant analysis of student and faculty data illustrates this gap. (See Figure 8.12)

Student expectations are consistently higher than those of the faculty on all learning mechanisms except the most traditional -- class discussions and class lectures. Interestingly, professor post course evaluations report that the highest emphasis is on "class discussions". In contrast student course evaluation data which were not included in the discriminant analysis revealed that the greatest emphasis is placed on "class lectures."

Across all other dimensions student expectations are uniformly higher than

those of the faculty. They hope for more independent research papers, more projects in industry, more visiting lecturers, more student interaction outside of class, more student faculty interaction, and more group projects. On the other hand the students recognize that there will be substantial emphasis placed on classroom lectures and discussions. The importance of these learning mechanisms is not denied. They simply hope for more imaginative, varied, and outside-world oriented learning experiences.

The greatest portion of the difference between student and faculty groups is encompassed by Function 1 which explains 97% of the total variation. The two items contributing most prominently to this function are student expectations regarding visiting lecturers and interaction with people from industry. Student desire for this type of interaction is clearly high. However, the faculty neither plans nor delivers the student expectations.

Application of the chi square group membership prediction technique to these data produces the results summarized in Table 8.18 page 8-56. This test simply reaffirms the discriminant analysis conclusions. Eighty-eight percent of the student Pre Term perceptions are correctly classified in the appropriate category. As might be expected, there is more consistency among student expectations than professor plans or after-the-fact perceptions. 26% of the professor Pre Course expectations are erroneously placed in the student category and the majority (26%) of the professor Pre Course expectations are incorrectly assigned to the Post Course category.

The fact that the majority of the incorrectly classified student Pre Term expectations are identified as professor Post rather than Pre Course statements adds further support to the contention that professorial change is in the direction of student desires.

From a managerial point of view the incongruity between student expectations and faculty plans represents an unnecessary source of potential conflict.

Table 8.18 Prediction of Group Membership For Student and Faculty Learning Mechanism Expectations and Faculty Post Course Perceptions

	Predicted Membership		
Actual Membership	Professor Pre Course	Professor Post Course	Student Pre Term
Professor Pre Course	10	6	3
Professor Post Course	13	26	10
Student Pre Term	8	4	98

It should be a relatively simple matter to provide an accurate picture of faculty plans for the program so that students may enter the academic experience with realistic expectations and "their eyes wide open."

Even more interesting is the question of how students obtain their erroneous expectations. Are these false perceptions generated by the school catalogue, promotional material, or the faculty themselves? It may even be that faculty members would share the students' value patterns if asked to describe the ideal learning situation. However, when planning an actual course they are forced by realities of time and resources to deviate from these ideals in the direction of "a realistic set of alternatives." It may be that even these pre term expectations are guilded with optimism and good intentions. Perhaps it is only at the end of the term with the cold realities of the preceding sixteen weeks close at hand that we attain a valid description of the actual learning experience. Student and faculty perceptions of this reality will be considered in greater detail in the following chapters.

Chapter 9

Measurement of Change

"Every measure undertaken with temerity is liable to be perplexed with error, and punished by misfortune."[1]

"There is nothing permanent except change."[2]

Earlier chapters have focused on between-school comparisons and population characteristics. Our attention now shifts to activities within each school and the changes perceived by students and faculty during the educational process. Previous analyses were characterized by relatively objective, current state measures. The data associated with this chapter are of necessity more subjective since they relate to perceptions of changes occurring during specified time periods. The objective of this chapter is to determine the levels at which significant student related change can be measured, and to assess the nature and relevance of such changes.

Our first approach to the measurement of change will be based on data obtained from the undergraduate and graduate school populations using parallel items on the Pre Term and End of Year Questionnaires. After demonstrating that change can be measured at this macro, one year, level we will attempt to refine our measurement of the graduate level educational experience to assess shorter time spans. The initial focus of this effort will be on changes in self perception and specific course related "learning outcomes" over a single sixteen week term. Finally, we will attempt to measure student perceptions during the term while course specific experiences are occuring. This sequence is illustrated in Figure 9.1 page 9-2.

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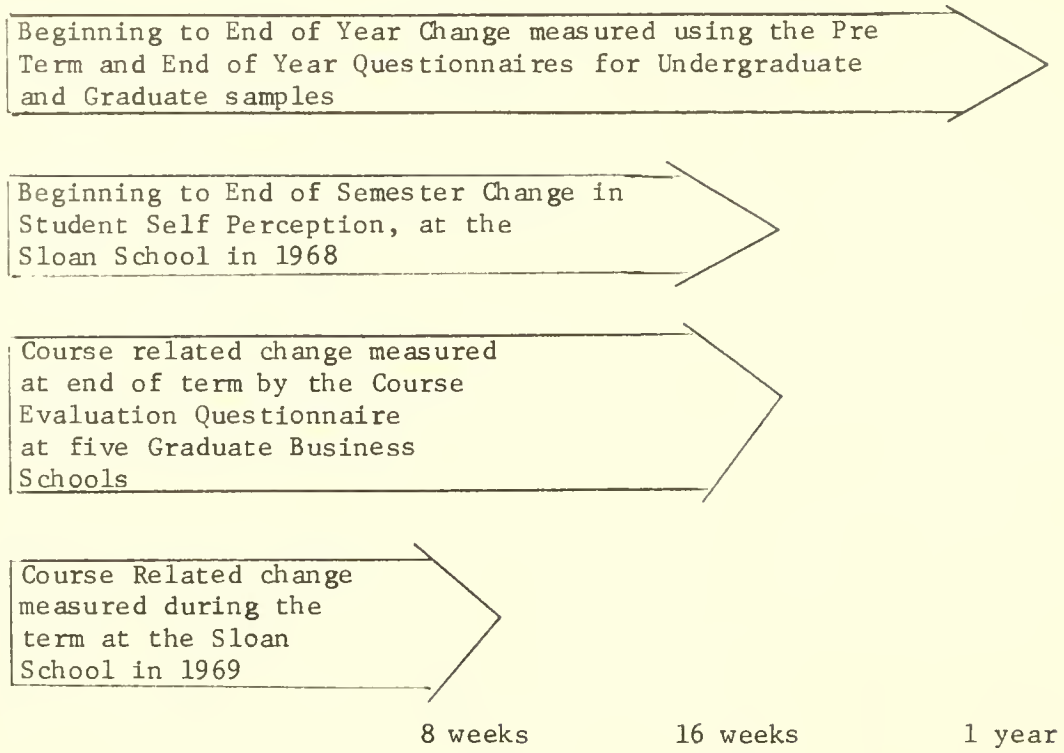
[1] Attributed to Herodotus, 484-424 B.C.

[2] Attributed to Heraclitus, 513 B.C.

Figure 9.1

Measurement of Change Over A Sequence of Time Periods


Beginning to End of Year Change measured using the Pre Term and End of Year Questionnaires for Undergraduate and Graduate samples
Beginning to End of Semester Change in Student Self Perception, at the Sloan School in 1968
Course related change measured at end of term by the Course Evaluation Questionnaire at five Graduate Business Schools
Course Related change measured during the term at the Sloan School in 1969
8 weeks
16 weeks
1 year

Measurement of course specific change involves more intensive (and potentially threatening) examination of student and faculty activities than the more aloof beginning and end of year studies. The presence of the research instrument may sensitize both students and faculty to certain aspects of the educational process. In addition, the collection of student perception data raises controversial and anxiety producing performance rating issues which will be discussed in Chapter 14.

Change Measured From Beginning to End of Year

Student responses at the beginning and end of the academic year were compared to determine the change, if any, that had occured on the dimensions measured by the Pre Term and End of Year Questionnaires. The objective of this analysis was to identify items registering consistent changes and to determine whether students at different schools have similar or divergent change patterns.

The earlier analysis of entering student attributes established the demographics, expectations, perceptions and opinions of students at seven undergraduate schools and five graduate business schools at the start of the fall 1969 term. With these base points established we are ready to begin exploring the changes that occur as the academic year progresses.

The questions to be answered range from the broad and general to the very specific. First, it is necessary to establish whether student responses at the beginning of the year differ significantly from those at year end. If a change (or variation) is present it will be useful to know whether all or only certain types of responses change. If all responses

change, it will be difficult to say much except "there certainly was change!". On the other hand, if limited classes of responses change while the majority remain constant, we may have some confidence that noted differences are meaningful.

Assuming that selective change is encountered, we will wish to identify the questionnaire items that produce shifts and those responsible for little or no change. It will also be important to determine the direction and extent of noted variations.

Finally, we must determine whether students at different schools exhibit similar or unique change characteristics. It will also be important to discover whether all students change equally or if students at particular schools are predisposed toward or susceptible to change.

Sample Stability and Respondent Change

Questionnaires were distributed to the same sample groups at each undergraduate and graduate school at the start of the fall 1969 semester and at the end of the spring 1970 term. However, not all students responded to both questionniares. The use of student identification numbers permitted recognition of specific students in both samples providing that the students used the same identification code on both questionnaires. Some students used Social Security or telephone numbers on fall term questionnaires and school assigned identification codes on Spring term forms and it was frequently impossible to link the two codes.

We could, of course, use all respondents in both groups providing we were able to convince ourselves (and you) that there was no non-response bias -- that the two samples were identical and would have produced comparable response distributions at the same time.

Clearly, the strongest assertions will be based on an analysis of responses from the same individuals at two points in time. However, the previously

noted identification number problem was only the first in a series of difficulties hindering this type of analysis.

The "strike" mounted in the spring of 1970 effectively eliminated data collection at a number of institutions.[1] In addition, none of the student identification numbers from Muskingum College respondents could be matched and no explanation or conversion procedure could be established.[2] As the result of these problems three of the seven undergraduate populations (Dartmouth, Muskingum and Southern Methodist) were eliminated from the individual response comparisons. Responses from the remaining four undergraduate schools (Boston College 25, Brandeis 24, Northeastern 48, and Wellesley 50) were used in the undergraduate change analysis. Graduate response patterns were similarly reduced to the following sample sizes: Boston College 11, Amos Tuck 35, Sloan 45, S.M.U. 30 and Stanford 7.

Although the smaller sample sizes limit the interpretive value placed on specific directional (positive or negative) changes, we will be able to determine which item sets consistently register changes (the volatile items) in student perceptions and the overall directional pattern of shifts, if any, which occur in the undergraduate and graduate settings.

Changes in Individual Responses

Data from identified respondents answering both fall and spring questionnaires were used to answer three of the questions posed at the beginning of this section:

1. Is there significant change from beginning to end of year?
2. Which responses change?
3. Do students at different institutions change in comparable ways?

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[1] See Chapter 5.

[2] Data from fall and spring have been checked bit by bit, with no apparent error occuring in the optical scanning, file creation or retrieval steps. We suspect that students used a school identification number at one sitting and their social security number at another.

The objective of the initial analysis was to determine which question sets measured the greatest amount of change, not to interpret response changes associated with individual variables or specific populations. The objective of this analysis was to locate variable sets that measure directional change.

The evaluation ultimately focussed on student educational and career objectives (Questions 14, 15, 16, and 29 from the Undergraduate Pre-Term Questionnaire; Questions 22, 23, 24, 29 from the Graduate Pre-Term Questionnaire) and student perceptions of self, ideal self, and a typical manager (Questions 30, 31 and 32 of both the Undergraduate and Graduate Pre-Term Questionnaire). The Schein Personal Opinion Questionnaire had been tested thoroughly in earlier research. Because of its proven stability and ability to measure student attitudinal shifts, it was excluded from our initial analysis.

To answer the first question posed above we computed the mean scores for responses given at the beginning and end of the academic year by students at each school responding to both questionnaires. A t-test was then used to determine if there were significant differences between means at the .01 or .05 confidence level.[1]

Undergraduate Change Analysis

Response Items Producing No Significant Change

Responses to the following items did not change significantly at any of the four institutions.

Question 14. Perceived strengths and weaknesses of educational institutions:

a. Quantitative emphases
b. Research opportunities
c. Qualitative emphasis
e. Social opportunities
f. Size of school
h. Prestige of school
i. Required courses
k. Integrated program
l. Practical experience available
m. Location
n. Cost and financial aid offered
p. Campus environment and facilities
q. Breadth of program
r. Type of student attending

[1] A good reference to t-test significance levels may be found in Robert Ferber, Market Research, McGraw-Hill, New York, 1949.

Question 15. Expectations as to how much certain activities will contribute to career objectives:

a. Problem solving or homework outside class
c. Independent research
d. Projects in industry
f. Community projects
g. Extra-curricular activities
i. Peer group interaction
k. Interaction with faculty
l. Research done with faculty member
m. Class discussions
n. Course lectures
p. Course reading preparation
q. Group projects
r. Seminars
s. Laboratory experiences

Question 16. Amount of change in self expected to take place as a result of present studies:

o. Willingness to take risks
p. Ability to recognize own abilities and limitations
q. Goals and aspirations for career
r. Knowledge of business principles

Question 29. Relative importance attached to various job attributes:

a. Have an opportunity for high earnings
b. Have job security
c. Have a job which leaves you sufficient time for your personal or family life
d. Have a job which is regarded highly by others.
e. Have considerable freedom to adopt your own approach to the job.
f. Work in a department which is run efficiently.
h. Have a job which allows you to make a real contribution to the sucess of the company or institution.
i. Have good physical working conditions (ventilation, lighting, etc.)
j. Get the recognition you deserve when you do a good job.
m. Work in a department where the people are congenial and friendly to one another
o. Have a reasonable work-load, one which is not excessive.
q. Have a job in which you have the opportunity to be helpful to others.

Question 30. Self Perception -- "You as You See Yourself"

Relaxed/Anxious
Competitive/Non-competitive
Not cynical/Cynical
Inflexible/Flexible
Guarded/Frank
Unenthusiastic/Enthusiastic
Soft/Hard
Inhibited/Uninhibited
Patient/Impatient
Impersonal/Personal
Idealistic/Realistic
Insensitive/Sensitive
Insincere/Sincere
Awkward/Poised
Cautious/Daring
Easily influenced/Mind of own
Feels inferior/Feels superior
Emotional/Unemotional
Friendly/Unfriendly
Humble/Proud
Mature/Immature
Unoriginal/Original
Tolerant/Prejudiced
Satisfied/Dissatisfied
Tactful/Tactless

Question 31. Perception of Ideal Self -- "You As You Would Like to Be"

Relaxed/Anxious
Competitive/Non-competitive
Lacks confidence/Confident
Not cynical/Cynical
Efficient/Inefficient
Inflexible/Flexible
Unenthusiastic/Enthusiastic
Soft/Hard
Subjective/Objective
Patient/Impatient
Impersonal/Personal
Idealistic/Realistic
Insensitive/Sensitive
Insincere/Sincere
Awkward/Poised
Cooperative/Uncooperative
Cautious/Daring
Easily influenced/Mind of own
Follows/Leads
Emotional/Unemotional
Friendly/Unfriendly
Mature/Immature
Tolerant/Prejudiced
Satisfied/Dissatisfied

Question 32. Perceptions of a "Typical Manager"

Relaxed/Anxious
Competitive/Non-competitive
Lacks confidence/Confident
Efficient/Inefficient
Inflexible/Flexible
Guarded/Frank
Inhibited/Uninhibited
Subjective/Objective
Patient/Impatient
Impersonal/Personal
Idealistic/Realistic
Insensitive/Sensitive
Insincere/Sincere
Awkward/Poised
Cooperative/Uncooperative
Cautious/Daring
Easily influenced/Mind of own
Emotional/Unemotional
Friendly/Unfriendly
Humble/Proud
Unoriginal/Original
Tolerant/Prejudiced

Questions Producing Significant Change

Table 9.1 identifies the number of response items producing significant change at the .01 and .05 level for all questions on which responses to at least one item changed significantly at one or more institution.

Table 9.1 Questions Producing Significant Change

Question Number	Number of Items	Question	Number of Items with Significant Change at the .01 level	.05 level
14	19	Strengths and weaknesses of your particular university	0	5
15	19	Expectations as to how much activities (learning mechanisms) will contribute to career objectives	2	3
16	21	Result of change you expect to take place (learning outcomes) as a result of present studies	11	6
29	17	Relative importance attached to various job attributes	3	2
30	30	Adjective description of self	2	3
31	30	Adjective description of ideal self	1	5
32	30	Adjective description of typical manager	2	6
Total	166		21	30

Response Items Producing Significant Change

Our analysis of these eight questions representing 166 response items identified 51 items or 30.7% of the total that produced significant change. The specific items on which these response changes were obtained are itemized below:

Question 14. Perceived strengths and weaknesses of educational institutions

d. Strength in a specific field of interest
g. Opportunity for specialization
f. Case studies
o. Faculty
s. Community involvement

Question 15. Expectations as to how much certain activities will contribute to career objectives.

b. Independent reading
e. Summer or school year job in industry
h. Outside lectures
j. Interaction with people from industry
o. Social activities

Question 16. Amount of change in self expected to take place as a result of present studies

a. Ability to analyze problems
b. Ability to apply techniques
c. Ability to formulate policy or goals
d. Ability to think creatively
e. Ability to formulate plans
f. Ability to communicate ideas
g. Ability to sell ideas to others
h. Ability to induce change
i. Ability to identify problems
j. Ability to work with people
k. Attitudes toward people
l. Ability to do research
m. Ability to make decisions
n. Knowledge of techniques
s. Personal attitudes and values
t. Attitudes towards business and industry
u. Self confidence

Question 29. Relative importance attached to various job attributes

g. Have training opportunities (to improve your skills or learn new skills).
k. Work for an organization with high prestige.
l. Have challenging work to do - work from which you can get a personal sense of accomplishment.
n. Have an opportunity for advancement to higher level jobs.
p. Have a job in which you can have much authority.

Question 30. Self Perception -- "You As You See Yourself"

Lacks confidence/Confident
Efficient/Inefficient
Subjective/Objective
Cooperative/Uncooperative
Follows/Leads

Question 31. Perception of Ideal Self -- "You As You Would Like to Be"

Guarded/Frank
Inhibited/Uninhibited
Feels inferior/Feels superior
Humble/Proud
Unoriginal/Original
Tactful/Tactless

Question 32. Perceptions of a "Typical Manager"

Not cynical/Cynical
Unenthusiastic/Enthusiastic
Soft/Hard
Feels inferior/Feels superior
Follows/Leads
Mature/Immature
Satisfied/Dissatisfied
Tactful/Tactless

Comparative Change Among Undergraduate Schools

Turning to the question of comparative change among schools, let us begin by looking at the magnitude (absolute value) of change on all significant questions. This information is summarized in Table 9.2 which contains the cumulative magnitude of changes associated with each question at each school and the average (absolute value) change per item. The appropriate reference for the average change is a seven point scale. Numbers in parenthesis in each column heading indicate the sample size of matched responses obtained at each school.

From Table 9.2 it is clear that the greatest change is associated with the same two questions at all undergraduate schools: Question 16 focusing on learning outcomes and Question 32 concerned with student perceptions of a "typical manager." It is interesting to note the consistency in the average magnitude of response change for each question across schools. See page 9-12.

From a managerial standpoint it is encouraging to see that the greatest magnitude of change is obtained on the learning outcome and managerial perception questions that are key to our assessment of the impact of educational programs on managerial aspirations. This consistency of change magnitude and emphasis on actionable process measures is particularly satisfying to those committed to measurement-based management of education. The apparent sensitivity of the learning outcome measures is especially gratifying since these dimensions are the focal point of the graduate process analysis.

Table 9.3 provides a more detailed analysis of these data indicating the

Table 9.2 Comparison of Response Magnitudes

Question Number	Items	Boston College (25)*		Brandeis (24)		Northeastern (48)		Wellesley (50)	
		Total	Avg/Item	Total	Avg/Item	Total	Avg/Item	Total	Avg/Item
14	19	610	1.3	536	1.2	1084	1.2	1009	1.1
15	19	726	1.5	557	1.3	1099	1.2	1250	1.3
16	21	925	1.8	865	1.8	1681	1.7	1873	1.7
29	17	354	.8	315	.8	669	.8	754	.9
30	30	693	1.0	662	1.0	1399	1.0	1263	.8
31	30	655	.9	783	1.1	1219	.8	1072	.7
32	30	961	1.3	894	1.4	1486	1.0	1460	1.0

*Note that response rates and thus population size, changes for each item, depending upon the number of students who responded to the particular item both in the fall and in the spring.

variables (response items) producing significant change (at the .01 and .05 level) at each school. The plus and minus signs in this table indicate the direction of change in the mean response to each question. See pages 9-14 to 9-17.

School Specific Changes

A quick tabulation of the total number of significant changes exhibited by students at each university reveals that Northeastern heads the list with 23 total items on which significant change occurred; fourteen at the .01 level and nine at the .05 level. Wellesley is second with ten changes at each level for a total of twenty. Boston College undergraduates also exhibit significant change on twenty items, however, only five are at the .01 level. Brandeis student responses to nineteen items changed significantly with seven shifts significant at the .01 level.

Boston College undergraduates exhibit the following changes significant at the .01 level. In the learning outcome area they show decreased expectations that their educational experience will affect their ability to analyze problems or think creatively. However, they place greater emphasis on the influence on their attitudes toward people. Increased importance is attached to working for an organization with high prestige and, on the self perception items they see themselves as becoming more efficient.

The changes significant at the .01 level as exhibited by Brandeis students fall in two areas. First, they place increased importance on the contribution outside lectures may make to their career objectives. Second, they exhibit negative change (decreases) in their expectations that their present studies will contribute to their ability to: analyze problems, apply techniques, formulate policy, think creatively, communicate ideas, or work with people.

As noted earlier, Northeastern students exhibit the largest number of change in toto and at the .01 level of significance. The greatest number of

Table 9.3

Significance and Direction of Changes in Responses to Items Producing Significant Change at Four Undergraduate Schools

Item and Wording	Boston College		Brandeis		Northeastern		Wellesley	
	.01	.05	.01	.05	.01	.05	.01	.05
Question 14 Strengths and weaknesses of educational institutions								
d. Strength in a specific field of interest				✓ −				
g. Opportunity for specialization						✓ +		
j. Case Studies		✓ −						
o. Faculty				✓ −				
s. Community involvement						✓ +		
Question 15 Expectations regarding contribution of educational activities to career objective								
b. Independent reading								✓ −
e. Summer and school year job in industry		✓ +						
h. Outside lectures				✓ +				✓ −
i. Interaction with people from industry		✓ +						
o. Social activities				✓ +				
Question 16 Change in self expected as a result of present studies (learning outcomes)								
a. Ability to analyze problems		✓ −		✓ −		✓ −		✓ −
b. Ability to apply techniques				✓ −		✓ −		✓ −

Table 9.3 Continued

Item and Wording	Boston College		Brandeis		Northeastern		Wellesley	
	.01	.05	.01	.05	.01	.05	.01	.05
Question 16 (Con't)								
c. Ability to formulate policy or goals			√ −					
d. Ability to think creatively	√ −		√ −		√ −		√ −	
e. Ability to formulate plans				√ −				
f. Ability to communicate ideas			√ −		√ −		√ −	
g. Ability to sell ideas to others		√ −				√ −		
h. Ability to induce change		√ −		√ −	√ −		√ −	
i. Ability to identify problems				√ −				
j. Ability to work with people			√ −					
k. Attitude toward people	√ +				√ +			
l. Ability to do research		√ −				√ −		
m. Ability to make decisions				√ −				√ −
n. Knowledge of techniques				√ −	√ −			√ −
o. Personal attidues and values		√ +		√ −	√ +		√ +	
t. Attitudes toward business and industry								√ +
u. Self confidence					√ −			
Question 21								
Reasons for pursuing graduate school								
d. Graduate study will be an important part of my career					√ −			√ +
e. I have a desire to learn about underlying disciplines in my particular field		√ +						
i. My family would be pleased if I were to enter graduate study		√ −						√ +

Table 9.3 Continued

Items and Wording	Boston College		Brandeis		Northeastern		Wellesley	
	.01	.05	.01	.05	.01	.05	.01	.05
Question 29								
Factors people might want in their work								
g. Have training opportunities (to improve your skills or learn new skills)								√+
k. Work for an organization with high prestige	√+							
l. Have challenging work to do - work from which you can get a personal sense of accomplishment								√-
n. Have an opportunity for advancement to higher level jobs						√-	√+	
p. Have a job in which you can have much authority					√-			
Question 30								
Describe you "As you see Yourself"								
Lacks Confidence/Confident								√+
Efficient/Inefficient	√-							√+
Subjective/Objective				√-				
Cooperative/Uncooperative		√-						
Follows/Leads				√-			√-	

Table 9.3 Continued

Items and Wording	Boston College		Brandeis		Northeastern		Wellesley	
	.01	.05	.01	.05	.01	.05	.01	.05
Question 31								
Describe you "As you would like to be"								
Guarded/Frank		√ −						√+
Inhibited/Uninhibited								
Feels Inferior/Feels Superior							√ −	
Humble/Proud							√ −	
Unoriginal/Original						√ −		
Tactful/Tactless							√ −	
Question 32								
Describe a Typical Manager								
Not Cynical/Cynical		√+						
Unenthusiastic/Enthusiastic		√ −						
Soft/Hard						√ −		
Feels Inferior/Feels Superior						√ −		
Follows/Leads							√ −	
Mature/Immature				√+				
Satisfied/Dissatisfied		√ −						
Tactful/Tactless		√+						

significant shifts are associated with the learning outcome dimensions. These include a reduction in the expected impact of present studies on their ability to: analyze problems, apply techniques, think creatively, and induce change. Their responses also indicate a reduction in their expectations that their educational experience will contribute to their knowledge of techniques or their self confidence. On the positive side, Northeastern undergraduates exhibit increased expectations regarding their program's contribution to their attitudes toward people and personal attitudes and values. Northeastern changes significant at the .01 level also include a reduction in the importance attached to graduate study, reduced emphasis on the importance of having a job in which you "have much authority", reduction of the importance of originality in their ideal self concept and a tendency to see the typical manager as less enthusiastic and hard.

Wellesley student changes significant at the .01 level include a reduction in the value attached to independent reading and in expectations regarding the change that present studies will have on their ability to analyze problems, apply techniques, think creatively, communicate ideas and induce change. Learning outcome expectations also reveal an increase in the perceived impact of educational experiences on personal attitudes and values. In view of the dramatic differences noted earlier it is interesting to observe the similarity of learning outcome change exhibited by Wellesley and Northeastern students.

Wellesley student responses on two self perception dimensions change with a significance of .01. Their ideal self image shifts to place greater emphasis on being "uninhibited" while their actual self perceptions change to incorporate a greater sense of "following" as opposed to "leading".

The density of check marks in Table 9.3 associated with question 16 attests to the sensitivity and significance of the learning outcome question items. Beyond this it is useful to note the differences in the significance

of particular questions across universities and the nature of significant change at particular universities. These considerations will be discussed separately.

Relative Question Significance Across Schools

Question 14 focusing on the strengths and weaknesses of educational institutions fails to produce a change significant at the .01 level at any of the four schools. In addition, different response items are significant at the .05 level at each school. Specifically: 1) Brandeis students show a decrease in the emphasis placed on strength in a specific field of interest and on the importance of the faculty; 2) Boston College students are less impressed with the value of case studies at the end of the year than they were in the fall; 3) Northeastern students placed greater emphasis on opportunities for specialization and community involvement in the spring than they did in the fall.

Question 15 assessing student expectations regarding the contributions that specific educational activities will make to their career objectives produce two changes significant at the .01 level: a decrease in Wellesley students' assessments of the value of independent reading and an increase in the value attached to outside lecturers by Brandeis students. It should be noted that Wellesley students show a negative change (but only at the .05 level) in the value they attach to outside lecturers. Brandeis students also exhibit an increase in the importance attached to social activities.

The remainder of the change detected by Question 15 is linked to two related changes in the perceptions of Boston College students who place greater value on summer and school year jobs in industry and interactions with people from industry.

In examining the changes associated with the learning outcome items of

Question 16 one is immediately struck by the preponderance of negative changes indicating reduced expectations. There are, in fact, only three items on which positive change occurs. And, all of these items involve attitudes as opposed to skills, current knowledge, or other types of learning outcomes. The three situations involving positive change are: 1) The increased expectations relating to attitudes toward people exhibited (with a .01 significance) by students at Boston College and Northeastern; 2) Change expectations regarding the impact of education on personal attitudes and values exhibited by students at all four universities, (The change on this dimension is positive at Boston College, Northeastern and Wellesley and negative at Brandeis); and 3) An increase of Wellesley student expectations regarding the impact of their educational experience on attitudes toward business and industry.

Two items associated with Question 16 exhibit negative change (reduced expectations) with a .01 level of significance at all four undergraduate institutions. These are the expectations regarding the impact of the educational process on: 1) Ability to analyze problems and 2) Ability to think creatively.

Students at all schools except Boston College indicate negative change significant at the .01 level in their expectations regarding the impact of their educational program on ability to communicate ideas.

Analysis of responses to Question 21 reveals an increase in the belief of Wellesley undergraduates that graduate study might be an important part of their career plans and please their families. In contrast, Northeastern students show a decreased emphasis (significant at the .01 level) in their belief that graduate study will be an important part of their careers.

Responses to Question 29 reveal three items in which change significant at the .01 level is recorded. Boston College undergraduates show an increased concern for working for an organization with high prestige. Northeastern students place less emphasis on having a job in which they have much authority.

Wellesley undergraduates attach greater importance to having a job that offers opportunities for advancement to higher levels.

The three perception questions (30, 31 and 32) show little consistent change. Only one item changes significantly at more than one school. Both Northeastern and Wellesley students exhibit a change in self perceptions from "leads" to "follows."

Two items in the adjective set associated with Question 30 achieve change significant at the .01 level. In addition to the 'leads-follows' transition of Wellesley undergraduates, Boston College students tend to see themselves as more 'efficient.'

Two items in the ideal self question generate change significant at the .01 level. These are: an increase in the importance Wellesley students attach to being 'uninhibited' and a decrease in the importance Northeastern students attach to being 'original.'

Question 32 relating to perceptions of the typical manager produced two changes significant at the .01 level. Both were exhibited by Northeastern students who came to regard the typical manager as less 'hard' and less apt to 'feel superior.'

Graduate Change Analysis

Response Items Producing No Significant Change

Responses to the following items did not change significantly at any of the five graduate business schools.

22. Strengths and weaknesses of your particular graduate school

b. Research opportunities
c. Qualitative emphasis
f. Size of school
h. Prestige of school
k. Integrated program
m. Location
n. Cost and financial aid offered
o. Faculty
q. Breadth of program
r. Type of student attending
s. Community involvement

23. Expectations as to how activities will contribute to your career objectives:

a. Problem solving or homework prepared outside of class
b. Independent reading
f. Community projects
g. Extra-curricular activities
h. Outside lectures
i. Peer group interaction
o. Social Activities

24. Amount of change in yourself that you expect to take place as a result of your present studies:

c. Ability to formulate policy or goals
d. Ability to think creatively
e. Ability to formulate plans
f. Ability to communicate ideas
g. Ability to sell ideas to others
h. Ability to induce change
1. Ability to do research
p. Ability to recognize own abilities and limitations
u. Self confidence

29. Relative importance attached to various job attributes:

b. Have job security
c. Have a job which leaves you sufficient time for your personal or family life
d. Have a job which is highly regarded by others
e. Have considerable freedom to adopt your own approach to the job
g. Have training opportunities (to improve your skills or learn new skills).
h. Have a job which allows you to make a real contribution to the success of the company or institution
j. Get the recognition you deserve when you do a good job
k. Work for an organization with high prestige
o. Have a reasonable work load, one which is not excessive
p. Have a job in which you can have much authority
q. Have a job in which you have the opportunity to be helpful to others.

30. Self Perception- "You As You See Yourself"

Relaxed/Anxious
Competitive/Non-competitive
Lacks confidence/Confident
Not cynical/Cynical
Guarded/Frank
Subjective/Objective
Patient/Impatient
Impersonal/Personal
Insensitive/Sensitive
Awkward/Poised
Cooperative/Uncooperative
Cautious/Daring
Easily Influenced/Mind of own
Feels inferior/Feels superior
Follows/Leads

Friendly/Unfriendly
Mature/Immature
Unoriginal/Original
Tolerant/Prejudiced

31. Perceptions of Ideal Self - "You As You Would Like To Be"

Not cynical/Cynical
Efficient/Inefficient
Inflexible/Flexible
Soft/Hard
Inhibited/Uninhibited
Patient/Impatient
Impersonal/Personal
Idealistic/Realistic
Insensitive/Sensitive
Awkward/Poised
Cooperative/Uncooperative
Follows/Leads
Humble/Proud
Mature/Immature
Unoriginal/Original
Tolerant/Prejudiced

32. Perceptions of a "Typical Manager"

Not cynical/Cynical
Guarded/Frank
Soft/Hard
Cooperative/Uncooperative
Cautious/Daring
Feels inferior/Feels superior
Emotional/Unemotional
Satisfied/Dissatisfied

Questions Producing Significant Change

Table 9.4 page 9-24 shows the number of items in each question set which measured significant change for one or more school samples. This table therefore identified all question sets (Question 22, 24, etc.) responsible for detecting significant change in our graduate samples.

Response Items Producing Significant Change

Analysis of the seven question sets which are composed of 166 individual response items yielded 85 items (51.2% of the total) which produced significant change in one or more school samples. Specific items which measured change are detailed below:

Table 9.4

Questions Producing Significant Change

Question Number in Pre Term and End of Year Questionnaire	Number of Items	Question Focus	Number of Items with Significant Change at .01	.05
22	19	Strengths and Weaknesses of your particular graduate school	2	6
23	19	Expectations as to how much activities (learning mechanisms) will contribute to career objectives	8	4
24	21	Amount of change you expect to take place as a result of present studies	6	6
29	17	Relative importance attached to various job attributes	4	2
30	30	Adjective description of real self	6	5
31	30	Adjective description of ideal self	8	6
32	30	Adjective description of typical manager	11	11
7 sets	166		45	40

22. Strengths and weaknesses of your particular graduate school:

a. Quantitative emphasis
d. Strength in your specific field of interest
e. Social opportunities
g. Opportunity for specialization
i. Required courses
j. Case studies
l. Practical experience available
p. Campus environment and facilities

23. Expectations as to how activities will contribute to your career objectives:

c. Independent research
d. Projects in industry
e. Summer or school year job in industry
j. Interaction with people from industry
k. Interaction with faculty
l. Research done with faculty member
m. Class discussions
n. Course lectures
p. Course reading preparation
q. Group projects
r. Seminars
s. Laboratory experiences

24. Amount of change in yourself that you expect to take place as a result of your present studies:

a. Ability to analyze problems
b. Ability to apply techniques
i. Ability to identify problems
j. Ability to work with people
k. Attitudes toward people
m. Ability to make decisions
n. Knowledge of techniques
o. Willingness to take risks
q. Goals and aspirations for career
r. Knowledge of business principles
s. Personal attitudes and values
t. Attitudes towards business and industry

29. Relative importance attached to various job attributes:

a. Have an opportunity for high earnings
f. Work in a department which is run efficiently
i. Have good physical working conditions (ventilation, lighting, etc.)
l. Have challenging work to do - work from which you can get a personal sense of accomplishment
m. Work in a department where the people are congenial and friendly to one another
n. Have an opportunity for advancement to higher level jobs

30. Self Perception - "You As You See Yourself"

Efficient/Inefficient
Inflexible/Flexible
Unenthusiastic/Enthusiastic
Soft/Hard
Inhibited/Uninhibited
Idealistic/Realistic
Insincere/Sincere
Satisfied/Dissatisfied
Tactful/Tactless

31. Perceptions of Ideal Self - "You As You Would Like To Be"

Relaxed/Anxious
Competitive/Non-competitive
Lacks confidence/Confident
Guarded/Frank
Unenthusiastic/Enthusiastic
Subjective/Objective
Insincere/Sincere
Cautious/Daring
Easily influenced/Mind of own
Feels inferior/Feels superior
Emotional/Unemotional
Friendly/Unfriendly
Satisfied/Dissatisfied
Tactful/Tactless

32. Perceptions of a "Typical Manager"

Relaxed/Anxious
Competitive/Non-competitive
Lacks confidence/Confident
Efficient/Inefficient
Inflexible/Flexible
Unenthusiastic/Enthusiastic
Inhibited/Uninhibited
Subjective/Objective
Patient/Impatient
Impersonal/Personal
Idealistic/Realistic
Insensitive/Sensitive
Insincere/Sincere
Awkward/Poised
Easily Influenced/Mind of own
Follows/Leads
Friendly/Unfriendly
Humble/Proud
Mature/Immature
Unoriginal/Original
Tolerant/Prejudiced
Tactful/Tactless

Comparable Changes Among School Samples

Now that we have identified which items are responsible for significant shifts in one or more populations, it is appropriate to ask "What is the magnitude of change measured for each question unit by school?" These figures will enable us to determine the most volatile question sets across populations, i.e., question sets which consistently measure change in our five samples.

Table 9.5 contains the cumulative magnitude of changes (absolute value) associated with each question set at each school and the average change recorded per item. The appropriate references for the average changes is a seven point scale. See Table 9.5 page 9-28.

Questions 23 and 24 exhibit the greatest change per item across five schools. Question 23 deals with change in expectations regarding which activities, or learning mechanisms will contribute most to the students' career objectives, and Question 24 measures expected changes in student learning outcomes, or managerial skills. Because of the importance we have placed upon change in managerial skills throughout the course of this research, we were delighted to find that the graduate change analysis yielded a greater degree of shift along these dimensions. (Note that the undergraduate change analysis emphasized the learning outcome measures and student perception of a typical manager.)

School Specific Changes

Table 9.6 provides a detailed breakdown of school specific changes per item. The plus and minus signs indicate the direction of changes in the mean responses to each questions. See Table 9.6 pages 9-29 to 9-33.

Amos Tuck students exhibit the greatest total number of significant response shifts - 18 at the .01 level and 19 at the .05 level, followed closely by Sloan students with 17 at the .01 and 19 at the .05 level. Southern Methodist University comes in third with 7 significant shifts at the .01 level and 14 at

Table 9.5

Comparison of Response Magnitudes

Graduate Pre Term and End of Year Questionnaire Number	Number of Items in Question Set	Amos Tuck Total	Amos Tuck Avg/Item*	Boston College Total	Boston College Avg/Item	Sloan Total	Sloan Avg/Item	SMU Total	SMU Avg/Item	Stanford Total	Stanford Avg/Item	Average Change per Item for 5 Schools
22	19	764	1.1	244	1.3	966	1.2	736	1.3	126	.9	1.16
23	19	819	1.2	301	1.4	1093	1.3	820	1.4	208	1.6	1.39
24	21	836	1.2	285	1.4	1275	1.4	744	1.2	255	1.7	1.38
29	17	530	.9	188	1.0	687	.9	425	.8	117	1.0	.92
30	30	929	.9	385	1.3	1084	.9	803	.9	205	1.0	.98
31	30	932	.9	275	.8	1037	.8	671	.8	295	1.4	.95
32	30	1151	1.1	366	1.2	1341	1.1	932	1.1	218	1.0	1.09

*The cumulative total score is divided by the population size (which changes by question set if students omit items) yielding the average change per question set. The average change is then divided by the number of items in each set to give the average change per individual item recorded.

Table 9.6

Significance and Direction of Changes in Responses to Items Producing Significant Change at Five Graduate Business Schools

Question Item and Wording	Amos Tuck .01	Amos Tuck .05	Boston College .01	Boston College .05	Sloan .01	Sloan .05	SMU .01	SMU .05	Stanford .01	Stanford .05
Question 22										
a. Quantitative emphasis		✓ +								✓ +
d. Strength in your specific field of interest	✓ −					✓ −				✓ +
e. Social opportunities										
g. Opportunity for specialization	✓ −							✓ −		
i. Required courses										
j. Case studies		✓ −								
l. Practical experience available								✓ −		
p. Campus environment and facilities							✓ −			
Question 23										
c. Independent research			✓ +					✓ −		
d. Projects in industry	✓ −									
e. Summer or school year job in industry	✓ −									
j. Interaction with people from industry	✓ −									
k. Interaction with faculty	✓ −									
l. Research done with faculty member	✓ −									
m. Class discussions		✓ −						✓ −		
n. Course lectures		✓ −								
p. Course reading preparation		✓ −						✓ −		
q. Group projects										✓ −
r. Seminars										✓ −
s. Laboratory experiences	✓ −									

Table 9.6 Continued

Question Item and Wording	Amos Tuck .01	Amos Tuck .05	Boston College .01	Boston College .05	Sloan .01	Sloan .05	SMU .01	SMU .05	Stanford .01	Stanford .05
Question 24										
a. Ability to analyze problems					✓ +					
b. Ability to apply techniques									✓ −	
i. Ability to identify problems		✓ +			✓ +					
j. Ability to work with people					✓ +					
k. Attitudes toward people		✓ +			✓ +					
m. Ability to make decisions						✓ +				
n. Knowledge of techniques									✓ −	
o. Willingness to take risks		✓ +							✓ −	
q. Goals and aspirations for career		✓ +								
r. Knowledge of business principles									✓ −	
s. Personal attitudes and values	✓ +									
t. Attitudes towards business and industry	✓ +									
Question 29										
a. Have an opportunity for high earnings	✓ −					✓ −				✓ −
f. Work in a department which is run efficiently	✓ −							✓ −		
i. Have good physical working conditions		✓ −							✓ −	

Table 9.6 Continued

Question Items and Wording	Amos Tuck .01	Amos Tuck .05	Boston College .01	Boston College .05	Sloan .01	Sloan .05	SMU .01	SMU .05	Stanford .01	Stanford .05
l. Have challenging work to do						✓ −		✓ −		
m. Work in a department where people are congenial and friendly								✓ −		
n. Have an opportunity for advancement										
Question 30 "You as you see Yourself"										
Efficient/Inefficient						✓ +				
Inflexible/Flexible							✓ −			
Unenthusiastic/Enthusiastic						✓ −		✓ −		
Soft/Hard		✓ −							✓ −	
Inhibited/Uninhibited				✓ +						
Idealistic/Realistic	✓ −									
Insincere/Sincere						✓ −				
Emotional/Unemotional						✓ −				✓ +
Humble/Proud								✓ −		
Satisfied/Dissatisfied						✓ +				
Tactful/Tactless				✓ +						
Question 31 "You as you would like to be"										
Relaxed/Anxious						✓ +				
Competitive/Non-competitive					✓ −					
Lacks confidence/Confident									✓ −	
Guarded/Frank		✓ +								
Unenthusiastic/Enthusiastic										✓ −

Table 9.6 Continued

Question Items and Wording	Amos Tuck .01	Amos Tuck .05	Boston College .01	Boston College .05	Sloan .01	Sloan .05	SMU .01	SMU .05	Stanford .01	Stanford .05
Subjective/Objective				✓ +						
Insincere/Sincere					✓ −					
Cautious/Daring		✓ +	✓ +							
Easily influenced/Mind of Own	✓ −					✓ −				
Feels inferior/Feels superior							✓ +			
Emotional/Unemotional					✓ −					
Friendly/Unfriendly									✓ +	
Satisfied/Dissatisfied					✓ +					
Tactful/Tactless							✓ +			
Question 32 A Typical Manager										
Relaxed/Anxious		✓ +								
Competitive/Non-competitive								✓ +		
Lacks confidence/Confident						✓ −				
Efficient/Inefficient					✓ +					
Inflexible/Flexible	✓ −				✓ −					
Unenthusiastic/Enthusiastic	✓ −					✓ −		✓ −		
Uninhibited/Inhibited		✓ −								
Subjective/Objective					✓ −					
Patient/Impatient						✓ +				
Impersonal/Personal		✓ −				✓ −				
Idealistic/Realistic						✓ −				
Insensitive/Sensitive	✓ −									
Insincere/Sincere		✓ −								

Table 9.6 Continued

Question Items and Wordings	Amos Tuck .01	Amos Tuck .05	Boston College .01	Boston College .05	Sloan .01	Sloan .05	SMU .01	SMU .05	Stanford .01	Stanford .05
Awkward/Poised					✓ −					
Easily influenced/Mind of Own					✓ −					
Follows/Leads		✓ −			✓ −					
Friendly/Unfriendly		✓ +			✓ +			✓ +		
Humble/Proud				✓ +						
Mature/Immature						✓ +		✓ +		
Unoriginal/Original	✓ −									
Tolerant/Prejudiced						✓ +				
Tactful/Tactless					✓ +					

the .05 level. Both Boston College students (1 at the .01 level and 5 at the .05 level) and Stanford (2 at the .01 level and 9 at the .05) show much fewer significant changes. Because of the small sample sizes and the impropriety of extrapolation to larger populations, (remember that the Stanford matched sample size is only 7!), we will give only brief consideration to the apparently significant variations.

Seven of the ten significant shifts recorded by the five schools on Question 22, which rates the strengths and weaknesses of the particular graduate school, are negative, indicating a somewhat lessened appreciation of school qualities from impressions registered at the outset of the school year.

All thirteen significant changes for Question 23 (learning mechanisms which will contribute to career objectives) are negative. Amos Tuck students dominate the scene with nine of the thirteen transformations.

In sharp contrast to Question 23, Question 24 (expected change in learning outcomes or managerial skills), provides eleven positive shifts (out of fifteen total recorded.) Amos Tuck and Sloan are responsible for the gains while the seven Stanford students record the four negative changes.

The pendulum is again reversed for Question which deals with factors important in a job. Changes on all eleven dimensions are negative.

Questions 30, 31 and 32 record a great many modifications in student perceptions, especially their image of the typical manager (30 significant shifts). In all these questions, Sloan students demonstrate the highest level of perceptual modifications (42.9% of the change measured by Question 30, 37.5% of change assessed by Question 31 and 50.0% of the change associated with Question 32). S.M.U. and Amos Tuck students are responsible for 33.3% of the noted changes in perceptions of the typical manager.

School Specific Changes

Amos Tuck students show significant changes in eighteen items at the .01 level of significance and nineteen items at the .05 level. They rate their school higher at the end of the year on quantitative emphasis (.05) and lower on three items: strength in specific field of interest (.01), opportunity for specialization (.01) and case studies (.05).

Learning mechanisms expected to contribute to career objectives (Question 33) slumped at the end of the year for Amos Tuck students - they reported significant shifts on nine items, all negative. They expected less contribution from projects in industry (.01), summer or school year job in industry (.01), interaction with people from industry (.01), interaction with faculty (.01), research done with faculty member (.01), laboratory experiences (.01), class discussions (.05), course lectures (.05) and course reading preparation.

In apparent contradiction to the Question 23 change pattern, Amos Tuck students record positive changes along six learning outcome managerial skill dimensions; personal attitudes and values (.01), attitudes toward business and industry (.01), ability to identify problems (.05), attitudes toward people (.05), willingness to take risks (.05) and goals and aspirations for own career (.05).

Tuck students changed significantly on only three of the seventeen dimensions used to describe expected job characteristics, Question 29. All three shifts are negative - they place less emphasis upon having an opportunity for high earnings (.01), working in an efficiently run department (.01), and having good physical working conditions (.05).

The only changes measured in Amos Tuck students' self perceptions indicate a move toward viewing themselves as more "idealistic" (.01), and "softer" (.05). Changes in the ideal self description include shifts toward "easily influenced" (.01), "frank" (.05) and "daring" (.05). Perception of a typical manager changes on ten dimensions. The typical manager is regarded as more

"inflexible" (.01), "unenthusiastic" (.01), "insensitive" (.01), "unoriginal" (.01), "anxious" (.05), "inhibited" (.05), "impersonal" (.05), "insincere" (.05), "follows" (.05) and "unfriendly" (.05).

Boston College students experience only six significant shifts, one at the .01 level of confidence and five at the .05 level. They move positively toward the idea that independent research will contribute to their career objectives (.05). The remaining five changes occur on the semantic differential questions 30, 31 and 32 describing self, ideal self, and the typical manager. They feel they have become more "uninhibited" (.05) and more "tactless" (.05) and hope to become more "objective" (.05) and "daring" (.01). Their perception of a typical manager changes along one dimension only - the typical manager is viewed as being more "poised" (.05).

Sloan students record change on thirty-six items - seventeen at the .01 level of confidence and nineteen at the .05 level. Most of the shifts occur along the adjective pair descriptions of self, ideal self and typical manager.

Strength in your specific field of interest (.05) and campus environment and facilities (.05) are recorded as being less important school descriptors at the end of the year than they were at the outset. Five learning outcomes measure significant positive shifts: ability to analyze problems (.01), ability to identify problems (.01), ability to work with people (.01), attitudes toward people (.01), and ability to make decisions (.05).

Sloan students place less emphasis upon having an opportunity for high earnings (.05) and having challenging work to do (.05).

Changes in Sloan student self images are detected on six dimensions. They describe themselves as significantly more "inflexible" (.01), "inefficient" (.05), "unenthusiastic" (.05), "insincere" (.05), "emotional" (.05) and "dissatisfied" (.05). Their real self images change significantly toward being more "competitive" (.01), "insincere" (.01), "emotional" (.01), "dissatisfied" (.01), "anxious" (.05) and "easily influenced" (.05).

There are fifteen significant changes in Sloan student images of the typical manager. Their prototype manager has become more "inefficient" (.01), "inflexible" (.01), "subjective" (.01), "awkward" (.01), "easily influenced" (.01), "follows" (.01), "unfriendly" (.01), "tactless" (.01), "lacks confidence" (.05), "unenthusiastic" (.05), "impatient" (.05), "impersonal" (.05), "idealistic" (.05), "immature" (.05), and finally "prejudiced" (.05). Some may call this realism!

SMU students show changes along twenty-one items, seven at the .01 level of confidence and fourteen at the .05 level.

SMU students place less importance upon required courses (.05) and practical experience available (.05) as characteristics of their school, and expect less contribution from independent research activities (.01), class discussions (.01), and course reading preparation (.05). Working in an efficiently run department (.01), having good physical conditions (.05), having challenging work to do (.05), working in a congenial department (.01) and having an opportunity for high earnings (.05) are not regarded as being as important factors in a job as they were at the beginning of the year.

The SMU student self image shifts significantly in three items - students regard themselves as more "unenthusiastic" (.01), "soft" (.05) and "humble" (.01). The ideal self image moves towards "lacks confidence" (.05), "unenthusiastic" (.05), "feels superior" (.01), "unfriendly" (.05) and "tactful" (.01). The typical manager becomes more "non-competitive" (.05), "unenthusiastic" (.05), "unfriendly" (.05) and "immature" (.05).

The Stanford sample of seven students who completed both questionnaires recorded three significant shifts at the .01 level and nine at the .05 level. They rate positively the quantitative emphasis (.05) and the social opportunities (.05) of their school. They score negatively on the contribution that group projects (.05) and seminars (.05) will make to their career objectives. Learning outcome change (which is positive at all other schools) is all negative for this small sample. They experienced less change in ability to apply techniques (.05),

knowledge of techniques (.05), willingness to take risks (.05) and knowledge of business principles (.05). They deemphasize the importance of having an opportunity for high earnings (.05) and having good physical working conditions (.01).

The semantic differential sets produce only one significant shift in the Stanford sample - they describe themselves as more "unemotional" (.01).

Comparisons of Undergraduate and Graduate Change Analysis

The overall undergraduate and graduate change analyses can be compared in three ways:

1. The number of significant shifts per question set for the undergraduate and graduate populations;
2. The percentage of items registering significant shifts; and,
3. The average item shift per student for each question set.

Table 9.7 presents the number of significant shifts at the .01 and .05 level of confidence reported by undergraduate and graduate students. (See page 9-39.)

It is apparent from this table that undergraduate students record fewer significant shifts in the semantic differential questions (30, 31 and 32) - 21%, than do graduates, 52%. Other questions sets have relatively similar percentages for graduate and undergraduate samples.

The overall percentage of items registering significant change is also considerably lower for the undergraduates - 30.7%, compared to the graduate percentage, 51.2. However, when we look at the average change per student in each question set for graduates and undergraduates (Table 9.8) the similarities appear to far outweigh the differences, suggesting that the total number of significant shifts may emphasize individual school change patterns, while overall population patterns remain relatively stable. See Table 9.8 page 9-40.

Table 9.7 Significant Undergraduate and Graduate Shifts in Response from Beginning to End of Year

Question Number Undergraduate	Graduate	Question Set	Number of Undergraduate Changes Significant at .01	.05	Number of Graduate Changes Significant at .01	.05
14	22	Strengths and weaknesses of your particular university	0	5	2	6
15	23	Expectations as to how much activities (learning mechanisms) will contribute to career objectives	2	3	8	4
16	24	Result of change you expect to take place (learning outcomes) as a result of present studies	11	6	6	6
29	29	Relative importance attached to various job attributes	3	2	4	2
30	30	Adjective description of self	2	3	6	5
31	31	Adjective description of ideal self	1	5	8	6
32	32	Adjective description of a typical manager	2	6	11	11

Table 9.8 Average Change Per Item for Total Undergraduate and Graduate Populations

Question Number			Average Change Per Item	
Undergraduate	Graduate	Question Set	Undergraduate	Graduate
14	22	Strengths and weaknesses of your particular university	1.2	1.2
15	23	Expectations as to how much activities (learning mechanisms) will contribute to career objectives	1.3	1.3
16	24	Result of change you expect to take place (learning outcomes) as a result of present studies	1.8	1.3
29	29	Relative importance attached to various job attributes	.8	.9
30	30	Adjective description of self	1.0	1.0
31	31	Adjective description of ideal self	.9	.9
32	32	Adjective description of a typical manager	1.2	1.1

Sixteen Week Change in Student Self Perceptions

A special study conducted at the Sloan School in 1968 assessed the change in student perceptions of self, ideal self and a typical manager after exposure to sixteen weeks of management education. This "End of Semester Questionnaire" was divided into two major sections involving the learning outcome dimension set and the semantic differential adjectives. It was designed to measure the students' total perceived change during one semester attributable to the program as a whole as opposed to individual courses.

Although apparently valid responses were obtained using this instrument students objected to the rapid reassessment of self perceptions, "... We just answered those questions last month." It may simply have been that the End of Semester Questionnaire was the proverbial straw that broke the respondent's back. Already burdened with four or five individual course questionnaires, students were loathe to fill out yet another form - especially one that requested apparently redundant information.

It might also be noted that the students were troubled by the use of learning outcome descriptors to describe the program as opposed to specific courses. Course specific assessment seemed "relevant" and related to a well defined, often discussed and regularly experienced classroom interaction. In contrast the program appeared more distant, amorphous, and abstract. Assessment of the program using the learning outcome dimensions demanded considerable introspection.

The End of Semester Questionnaire was omitted from the questionnaire set administered in the multi-school study for these practical reasons and because of a research finding. In short, the students were right. The data were redundant. Semantic differential responses compared from the beginning of the year to the end of the first semester were amazingly consistent. Change scores were very low. For example the real self image of students shifted an

average of only .2 on a 7 point scale from the beginning to the end of the first semester. The largest individual shift measured in the semantic differential comparisons, .6, was on the 'subjective'/'objective' continuum, followed by two .5 shifts ('feels inferior'/'feels superior' and 'follows'/'leads'). Thus the largest individual item shifts in the 16 week study are considerably lower than the average one year shifts measured in both the undergraduate and graduate beginning to end of year studies - 1.0.

Sixteen Week Course Specific Changes

The Course Evaluation Questionnaire was much more successful in measuring short term (sixteen week) change. Distributed at the completion of each course, this questionnaire asked students to report perceived self change which they specifically attribute to their recent experience in that course. The learning outcome dimensions on the Course Evaluation Questionnaire were designed specifically to measure these perceptions of change and will be the focus of this discussion.

Our analysis of course specific change was designed to achieve three objectives: 1) to reduce the large number of individual learning outcome response items to a limited set of underlying concept dimensions; 2) to demonstrate that the concept dimension can be used to differentiate among courses in a reasonable and logically consistent manner; and, 3) to verify that the measures can isolate significant attributes of the educational process occuring within particular courses.

The research approach adopted in this analysis directly parallels these objectives.

1) Responses obtained using the learning outcome dimensions were factor analyzed to establish the factor structure -- learning outcome concepts -- previously described in Chapter 5.[1]

[1] See Chapter 5 pages 5-77 to 5-80.

2) Multiple course comparative analyses were undetaken to determine the nature and extent of between course differences.

3) Within course response variables were evaluated to determine the consistency of student perceptions of the educational outcomes associated with particular courses.

Factor Structure

Factor analysis of the learning outcome responses produced a statistically sound and easily interpreted course evaluation factor structure. The twenty-one learning outcome variables were reduced to four factors: interpersonal relations, knowledge of business, personal insights and managerial skills.

Within and Among Course Differences

Between course comparisons were performed to test our ability to discriminate among courses involving different academic disciplines, functional content areas and pedagogies. The report generator described in Chapter V was used to produce comparative plots of response means (X), variation (V), skewness (S) and range (+-----+) for each course. The resulting displays provided an efficient visual comparison of data generated by students in different courses. Figures 9.2 and 9.3 present data from two very different types of courses: six sections of an accounting and computer oriented Information and Decision Systems course and three sections of a Human Factors in Management course which explores the 'softer' area of interpersonal relations. (See Figure 9.2, p. 9-44 and Figure 9.3,p.9-45)

Figure 9.2 compares the nine course sections on the "Interpersonal Skills" factor and indicates the perceived change on this dimension reported by students in each section during one semester. All Information and Decision Systems sections are rated as producing significantly less change in ability to communicate ideas than any Human Factors section. In addition Section 1 of Information and Decision Systems is different from section 4 and 5 of the same course at a .05 level of significance.

Figure 9.2
Changes Perceived in Six Sections of Information and
Decision Systems I and Three Sections of Human Factors in Management I
Compared on the Communication Ability Factor

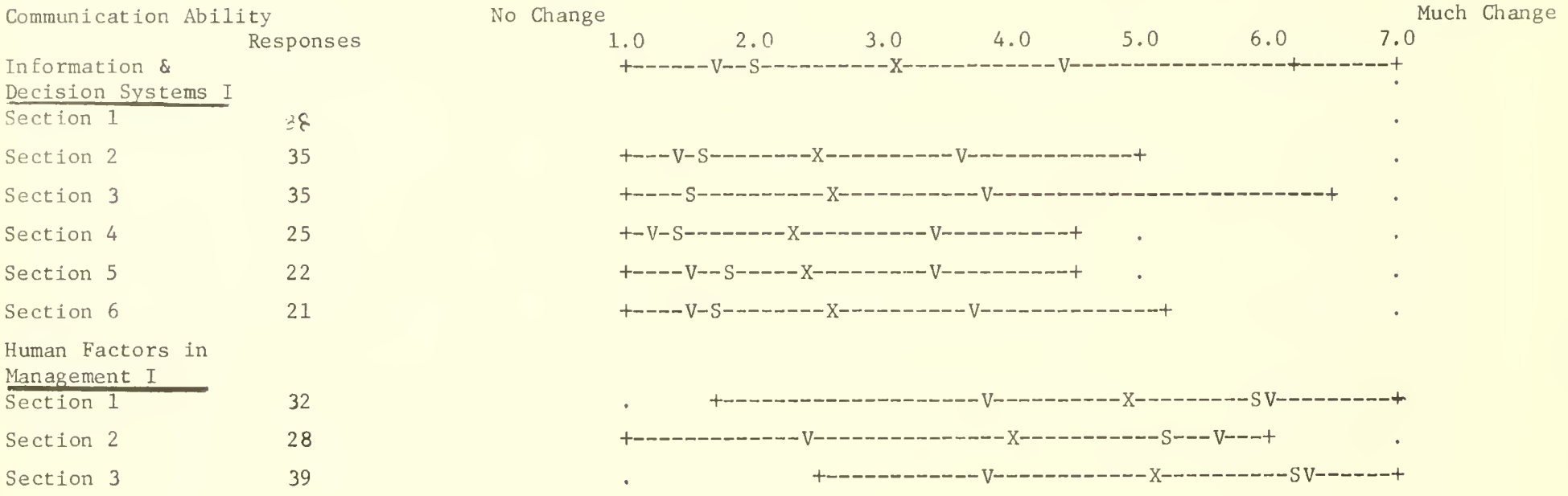
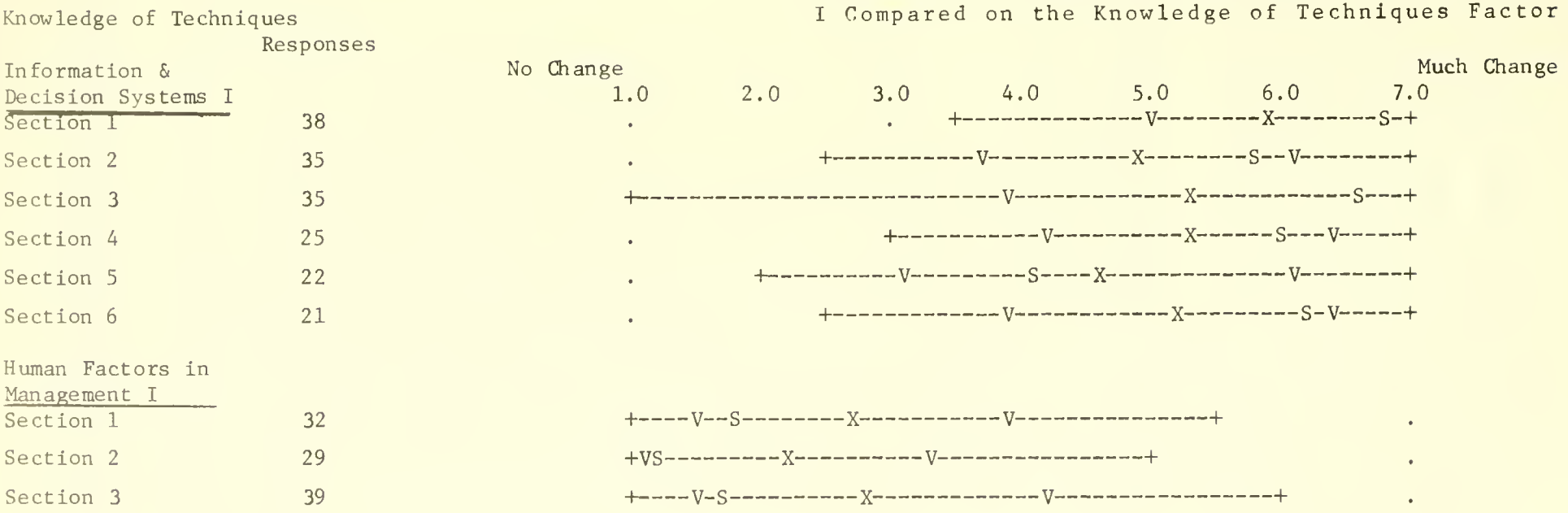


Figure 9.3 Changes Perceived in Six Sections of Information and Decision Systems I and Three Sections of Human Factors in Management I Compared on the Knowledge of Techniques Factor



The situation is reversed in Figure 9.3 where the nine sections are evaluated on the "Knowledge of Techniques" factor. The three Human Factors in Management I sections are all given significantly lower ratings on this dimension. In addition, responses from the first section of Information and Decision Systems are significantly higher than those from all other sections included in the analysis.[1]

Both examples illustrate the use of factor scored learning outcome change data to differentiate among types of courses and to detect significant differences among sections in a single course.

It is important to note the consistency among the five sections of Information and Decision Systems taught by different instructors illustrating the measure's adaptability to differences in individual faculty teaching style.

Measurement of Change During a 16 Week Course

The course evaluation questionnaire's primary application was in measuring change over one semester. However, the instrument was used experimentally to assess change over shorter time intervals. The special study described in this section demonstrates that marked shifts in student perception can occur and be measured within an eight week time span.

The course involved in this special study was itself experimental, involving videotaped lectures, management interviews and videotaped case material, in addition to discussions with faculty members and teaching assistants. Four instructors taught portions of this introductory course. Each was responsible for presenting material associated with a particular functional area. The common denominator and underlying disciplines on which the course was based was a systems analytic approach to management. A prime objective of combining diverse functional perspectives in a single course was to "expose students to the complexity of real life situations by dealing with global problems *in toto* as distinguished from treating

[1] Although the factor structure produced by the 1968 study was based entirely upon Sloan School data, the resulting factors bear marked resemblance to those generated from the five graduate schools of business in the following year.

their functional aspects independently"[1] Other objectives included elimination of redundancy by combining problem solving approaches and techniques common to all functional areas, condensing the curriculum, and helping students learn to cope with "... ambiguity by dealing with realistic situations" ... and ..." to provide practice in problem identification."[2] The course was a degree requirement compulsory for all students.

Eight Week Qualitative Evaluation

Course evaluation questionnaires were administered after the first eight weeks of the course at the mid point of the term. Two instructors had completed their section of the course, and the two instructors responsible for the second half were aware that students were disturbed by the television format and questionning the effectiveness of the course. Dissatisfaction with the course had already spurred five students to distribute a notice to all course participants shown in Table 9.9 page 9-48. Their findings were summarized in a memo to the course faculty.

> Having sensed an enormous amount of dissatisfaction with ... (the course) ..., we decided to take some positive action toward surveying the opinions of other students and then presenting our findings to you. Our main objective in doing this was to pinpoint sources of dissatisfaction which appear to us to have interferred with the learning process. We realized that different people were dissatisfied with different aspects of the course so we tried to list as many specific aspects of this dissatisfaction as we could. We tried to isolate areas of feedback that were specific enough to suggest specific corrective measures.

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[1] From a Sloan School interdepartmental memo from Dean T. Hill to A. Amstutz dated April 8, 1970.

[2] Ibid.

Table 9.9 Student Designed Course Evaluation Form

We are dissatisfied with ...(the course)... as it stands. We recognize that ...(it)... is an experimental course, however, we feel that there are a number of dimensions where it can and should be improved. Some specific complaints are listed below. Please check those with which you agree. Add your own complaints and sign if you want to. Return this sheet in the folder of one of the undersigned individuals.

We will compile the data and present the results to the professors responsible for the course in the hope of some improvement.

Check if You Agree	
_____	Case discussion not suitable for T.V. presentation
_____	Poor camera-instructor coordination
_____	Lectures not properly prepared for T.V.
_____	Late handouts
_____	Homework takes too long relative to its value
_____	Poor TA-faculty coordination
_____	Poor course content integration
_____	Little apparent response to feedback from students

Other:

135 copies of our statement were distributed to first-year master's students and 60 responses were received. The results are tabulated below.

43 people felt that case discussions are not suitable for T.V.
43 people agreed that camera-instructor coordination is poor
33 people felt that the lectures had not been properly prepared for T.V.
31 people complained of late handouts
37 people felt that homework took too long relative to its value
31 people complained of poor teaching assistant-faculty coordination
33 people complained of poor course content integration
41 saw little apparent response to feedback from students

These issues are primarily mechanical. We feel, however, that there are a number of somewhat more philosophical and conceptual problems as well. There seems to be as much dissatisfaction in this area as with the mechanics. There is, for example, the feeling that since (the course) is in the experimental stage, it should not be required. In addition, some have suggested that it be made a pass-fail course.

We would like to discuss with you these and any other issues in which you are interested.

Data from the Course Evaluation questionnaires largely verified these reactions and provided additional insights into student perceptions and concerns. Responses on the comment sheets appended to the questionnaires underline the students' negative reaction to the first half of the course. In addition to remarks directed toward individual faculty teaching styles and course content, the majority of students expressed hostility toward the use of "canned" lectures, faculty inaccessability, and the structure of class and group meetings, assignments and examinations. Some students applauded the innovative nature of the course, but all had substantial misgivings about presentations during the first half. The largest number of comments related to the use of television. Most attacked the 'canned' T.V. presentations noting the absence of student-faculty interaction in the classroom and revealing a strong negative "gut reaction" to the concept of watching a television monitor:

"If the professors don't want to give multiple lectures (I would think they should hate giving multiple lectures) then I would prefer to have a large lecture class rather than a groupie little telethon. Besides being monotonous and unresponsive, the television presentations take the spirit (I assume the presence of some human spirit) out of the course. I have not been motivated by televised lectures to actively pursue the knowledge available from the resources involved in the course. The switch from weekly recitation sections to live (and in color) instructors at each lecture was a great improvement and an important (but incomplete) move toward the creation of a satisfying intellectual and spritual atmosphere in the class. In a world suffering from an overexposure to technology and rapid change, (this course) is a step backward toward bureaucracy in a world looking for its lost humanism."

"I did not pay tuition to watch an 8 inch man."

"This course is highly unorganized and boring. The videotape lectures are uninspiring and excessively boring due in large part to the medium itself. Some people just cannot relate to a television and suffer lack of motivation."

"The content of the course has been very good, but the course has been run in a rather terrible fashion. I don't know how a taped lecture series should be done, and find same seems to be true for the teaching staff. I do not believe in taped case discussions."

"There were technological and organizational problems which arose and gave the course a bad reputation, but I think these were overplayed by the critics. I am not sold on the use of TV for teaching purposes, but I am not sure why I feel this way. I wonder whether I could have spent all those class hours in the library studying and used the time more efficiently."

"I really hate this course. The idea of getting up in the morning to trudge to Sloan to watch a TV program I probably wouldn't watch at home is frightening. The material is important but the course structure is over-powering."

"While he is never going to replace the late movie, the 45 minute sessions with him in person were fairly interesting. I was actually grateful for the TV sessions because (1) it was the only chance I had to read the New York Times (2) my parents were grateful because now I had a chance to write a letter home. It was also an excellent occasion to balance one's bank statement, catch up on sleep, ... Occasionally it was even interesting. Rarely was it unbearable."

"I never realized how much commercials add to television."

Other respondents noted particular technical weaknesses in the quality of television production.

> "On the rare occasions that I could actually read his charts I go mal-de-mer from the zoom in shots and the way things tended to be poured from one end of the screen to the other, horizontally. Someone needs a plumb-line."
>
> "I have some small hope for TV lectures but you had better send the profs to actor's school - also should encourage cooperation between prof and cameraman."
>
> "Professor X's material and the majority of his notes were very, very interesting to me and much of the class frustration, at least much of mine, stemmed from the poor quality of the TV presentation."

There were, of course positive reactions primarily commending faculty efforts and the course content. However, the videotape lectures were universally unpopular.

When viewed as a whole the student comments raise a difficult pedagogical issue. Their major concern is that the television medium robs them of a sense of participation, of human interaction with the faculty member during the presentation. The student who prefers "... a large lecture class to a groupie little telethon" must realize that a large (200 student) lecture also precludes meaningful faculty/student interaction. However, in the large lecture he is evidently able to maintain the illusion that he (or the faculty member) could initiate some kind of relationship even though the realistic opportunity for such interaction is all but eliminated by course size. The student confronting the tube has lost that psychological advantage. He cannot even hope for such interaction.

Faculty Response

Faculty members responsible for the second half of the course reviewed the data carefully and concluded that the television could be used effectively

if they used the medium to provide students with material not normally available within the classroom setting and if they deemphasized the faculty lecture format which invited unfavorable comparisons to traditional classroom activities.

Some members of the administration proposed that the TV format be eliminated. However the faculty believed they could build on the lessons learned in the first semester and create a "turn around" in the second half of the course.

End of Term Evaluation

Course Evaluation questionnaires were distributed again at the end of the course. Resulting data were compared with responses from the first half survey, and also to data from the same course taught using a traditional classroom format during the previous year. The following comparative analysis is based on quantitative data from the Course Evaluation form, and qualitative comments solicited on a "Comments and Suggestions" sheet at each of the three measurement points. Comments received at the end of the year indicate a totally different, and generally positive perception of the television presentations. Direct comparison of faculty performance is not at issue. The faculty in the second half had the distinct advantage of learning from analysis of earlier problems. The critical issue is our ability to measure this radical shift from near revolt to positive support. A few comments will illustrate the qualitative attitude shift.

> "This part of the course was one of the best I have ever taken. The taped interviews were excellent. ... If video tape is used as a medium as it has been in this part of the course, it can be fantastically informative and useful. However, if video tape is used merely to give one lecture instead of 4, the whole thing comes across very poorly. If the whole course could be nearly as good as this section was, (it) would be one of the best and most useful courses in the school. Otherwise, it will create antagonism among

> students as it did earlier this year. All parts of the course should take advantage of relevant taped interviews."
>
> "Made effective use of video tape. Strongly recommend for content."
>
> "The scope of the course and the integration of the areas make a basis for an excellent course. With a bit more streamlined execution it could be one of the best courses available ..."

Many specific remarks at the end of the term directly contradict the majority opinion expressed after the first eight weeks. For example, after eight weeks one student commented:

> "Cases on TV are totally useless - more than that, they hurt the cause - especially when you can't hear half of the conversation."

In contrast responses at the end of the year have a much different ring to them.

> "Case studies were very relevant and helpful ..."
>
> "This is the only course which has related (by means mainly of video tape interviews) the course material to real world problems. Why is it the only one?"

Short Term Change Measurement

The critical question remaining is whether or not the Course Evaluation questionnaires produced a valid reflection of changing student perceptions at each point in this sequence. Will the quantitative measures from this instrument detect the conditions established by the qualitative comments and open ended responses?

Figure 9.4 provides a graphic summary of the distribution of responses indicating perceived change in "Communication Ability" (similar to the Interpersonal Relations factor described in Chapter V) at 1) the end of the first half of the course, 2) the end of the second half of the course and 3) the end of the previous year's course. Responses at the end of the second half have a significantly higher mean score (.01 Significance in a

t-test) than the first half of the course, and a somewhat higher (.05) mean than the course taught the year before. See Figure 9.4 page 9-55. This example is by no means unique. Responses on seven of the thirteen factored dimensions produce positive changes in student perceptions from the first to the second half of the course that are significant at the .01 level of confidence. These are:

Communication Ability (t.01)
Attitude Change (t.01)
Self Awareness (t.01)
Practical Emphasis of Course (t.01)
Course Organization and Presentation (t.01)
Student Autonomy (t.01)
Feedback to Students (F.01)

Perhaps equally important there were also dimensions along which no significant shifts were experienced between the first and second half of the course; for example the "Knowledge of Techniques" factor shown in Figure 9.5 page 9-56 First half responses on this factor are, however, significantly lower (t .05) than the course taught in the previous year.

Course evaluation responses also reflect operational changes made in the course. The Feedback to Students factor, for example, (Figure 9.6 page 9-57) indicates a strong (F.01) change in the perceived feedback to students.

This experiment has clearly demonstrated the applicability of the course evaluation measures to short term (8 week) intra-course assessment as well as longer term (16 week) intra- and inter-course evaluation.

Figure 9.4

Graphic Comparison of Student Responses on "Communication Ability" Factor in First Half, Second Half and Prior Year Course

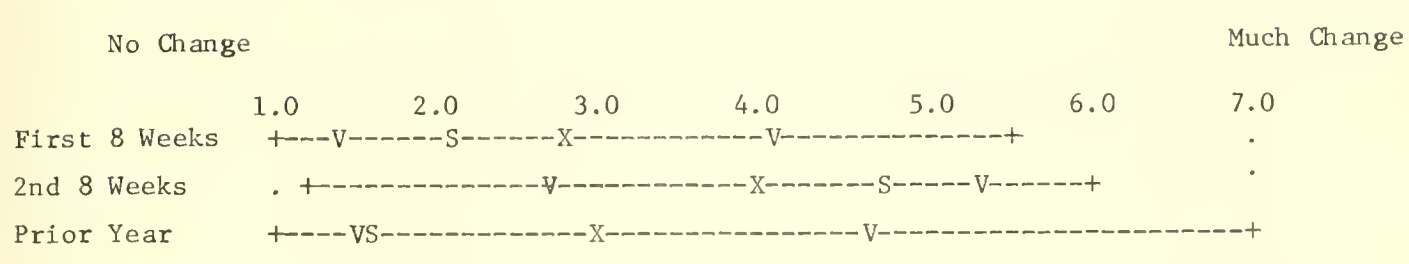


Figure 9.5

Graphic Comparison of Student Responses on "Knowledge of Techniques" and "Working Pressure" Factors in First Half, Second Half and Prior Year Course

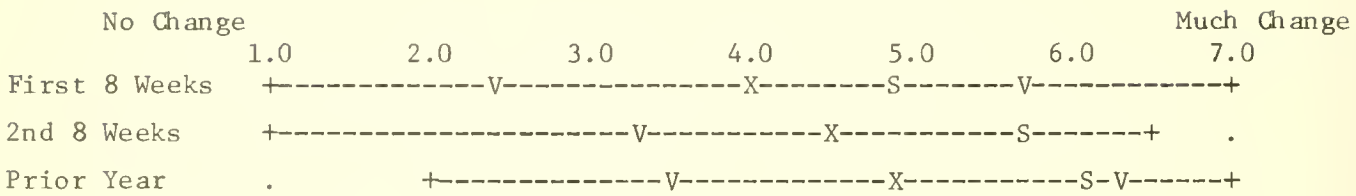
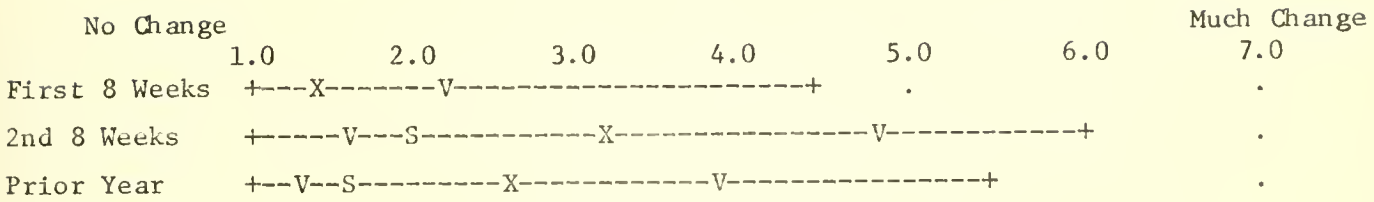


Figure 9.6

Graphic Comparison of Student Responses on "Feedback to Students" Question in First Half, Second Half and Prior Year Course



Chapter 10

Course Classification

"Had I been present at the creation, I would have given some useful hints for the better ordering of the universe."[1]

We have now established that the educational process produces change and, more important, that the change produced can be measured. However, we have yet to determine whether particular types of change (learning outcomes) can be attributed to specific parts of the educational process.

Our attempts to establish a linkage are necessarily constrained to focus on an important but limited aspect of the total educational experience. We have assumed that change is properly attributed to interactions among students, faculty, and course content. This assumption explicitly excludes such extracurricular influence as the student social life (or lack of same), his living conditions, participation in outside activities and other factors that might exert a significant influence on overall development. On the other hand we are not attempting to measure or evaluate all changes occuring in the student during the two year period studied. Since our change measure focuses on learning outcomes, exclusion of non-course related influences is partially justified by the parallel exclusion of non-course related measures of change.

Available data permit course related portions of the educational process to be approached from several vantage points. Student Pre Term information provides a broad perspective on the backgrounds, objectives, and expectations of students entering the classroom interaction. Faculty intentions and objectives with respect to each course are well represented by data from the faculty Pre Course questionnaires. Actual developments within each course are reported from the student perspective in the Course Evaluation questionnaires and from the faculty point of view by the Faculty Post Course

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[1] Attributed to Alfonso the Wise who died in 1284.

assessment.

Alternative Approaches to Classification

The managerial objective is clear. We wish to define a limited number of classroom interaction processes. The Chapter 4 description of conceptual model development rejected the contention that each student-teacher interaction is unique. The issue now is to determine which interactions are similar.

This problem might be approached in either of two ways. The student may be taken as the unit of analysis and an attempt made to induce a limited number of classroom interaction patterns by categorizing individual student experiences. Alternatively, the instructor or course may be accepted as the basic unit of analysis. Given this choice the problem may be approached inductively, beginning with an analysis of each course and working toward the synthesis of an overall structure, or deductively, examining the overall process and attempting to deduce a classification structure from observed relationships.

The instructor oriented approach is conceptually attractive since the course is the smallest unit to which resources can be allocated. The individual course is, however, not a practical unit of process description since the manager who is forced to treat each class as a separate and distinct activity faces an impossible administrative chore. The current objective is to develop a classification scheme that will permit the manager to consider trade-offs among a limited number of course types viewing individual subjects within one classification as equivalent educational processes and leaving lower level resource allocation to those administering each classification.

Historic classification schemes have been founded on underlying disciplines. Arguments supporting this structure rest on the assumption that course content is the relevant basis for classification. There are also persuasive group dynamic consideration supporting this contention. Professors concerned with

similar subject matter are interested in the same problems, read the same journals, share common values, and are therefore relatively compatible members of a single discipline oriented departmental group. The division of management faculties into marketing,production, finance and other "functional" subdivisions is therefore "only natural." It is, nevertheless, useful to challenge the existing categorization scheme if only to find that, at least in the existing environment, it is a valid construct. It might be argued, in fact, that existing practices and group identifications should produce a strong bias toward such an outcome. Since faculty members and students identify with functionally organized departments it is reasonable to assume that educational processes or at least common perceptions of classroom interactions will be associated with membership in the established functional groups.

The analysis reported in this chapter focuses on the course as the fundamental unit of analysis. This choice is dictated by an important operating consideration in addition to the noted conceptual factors. When evaluating preliminary analyses of student and course based clusters,faculty and administration were more comfortable working with course groupings and had a strong intuitive grasp of the reasons for "fit". In contrast, the dimensions on which the student clusters were based often appeared "ambiguous and confusing". This is not to say that the student based analysis would not be equally rewarding. Studies at M.I.T. and other universities including the work of Dr. Snyder referenced in Chapter I[1] have adopted this perspective. However, compatability with the ongoing work of the Master's Program Committee and ease of communication argued for the use of a course oriented structure.

Research Design

The objective of the current analysis is relatively straightforward -- to establish a categorization scheme that will isolate and combine courses

[1] See Chapter 1, pp. 1-7 to 1-9.

producing similar types of change measured along the learning outcome dimensions. However, a fair amount of mathematical detective work is required to achieve this objective.

As noted earlier each course unit is described in the data base from two points of view: the professor's perception reflected in the Professor Pre and Post Course evaluations and the student perceptions reported in the Course Evaluation Questionnaires. While student and faculty assessments of particular courses may vary, a meaningful process-based classification scheme should produce comparable results based on either set of perceptions.

If the categories established are based on educational processes that are really different it should be possible to assign courses to categories on the basis of either student or faculty perceptions. Students and faculty may hold conflicting views of the value or relevance of particular course content. However, they should provide reasonably consistent descriptions of the process associated with the course.

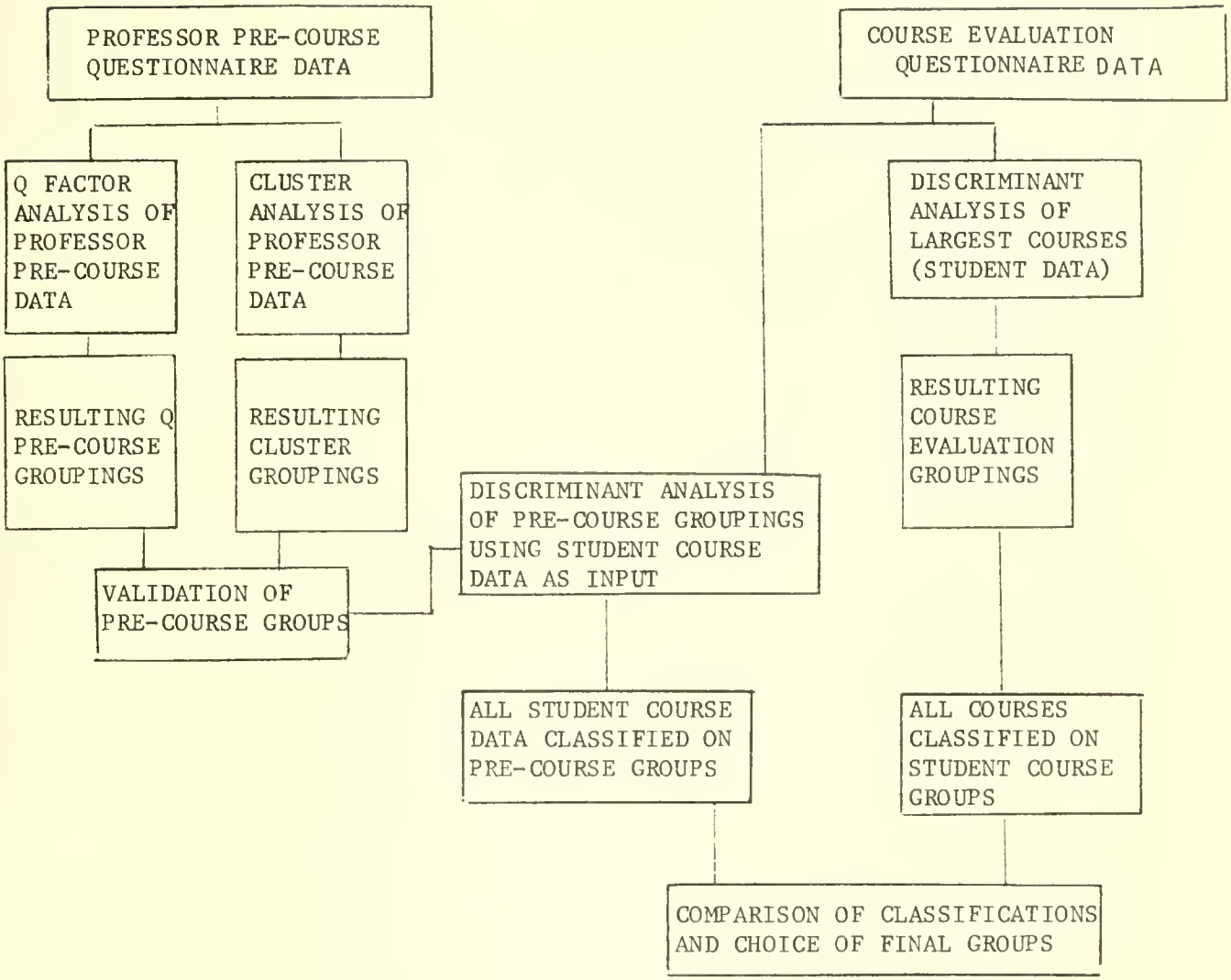
Furthermore, if the categorization scheme incorporates significant process elements it should be possible to assign courses based on a professor's plans as well as after-the-fact evaluation. This is an absolute requirement if the framework is to support program management since administrators are more concerned with before-the-fact allocation than after-the-fact evaluation.

The procedures followed in this classification analysis are summarized in Figure 10.1 which illustrates the parallel evaluation of faculty plans and expectations reported in the Professor Pre Course Questionnaire and student perceptions reported by the Course Evaluation Questionnaire. See page 10-5.

In the first step of this process faculty Pre Course data were analyzed using the Q factorial technique described in Chapter 5.[1] The objective of this

[1] See Chapter 5, pp. 5-27 to 5-29.

Figure 10.1 Classification Analysis Research Plan


PROFESSOR PRE-COURSE QUESTIONNAIRE DATA
COURSE EVALUATION QUESTIONNAIRE DATA
Q FACTOR ANALYSIS OF PROFESSOR PRE-COURSE DATA
CLUSTER ANALYSIS OF PROFESSOR PRE-COURSE DATA
DISCRIMINANT ANALYSIS OF LARGEST COURSES (STUDENT DATA)
RESULTING Q PRE-COURSE GROUPINGS
RESULTING CLUSTER GROUPINGS
RESULTING COURSE EVALUATION GROUPINGS
DISCRIMINANT ANALYSIS OF PRE-COURSE GROUPINGS USING STUDENT COURSE DATA AS INPUT
VALIDATION OF PRE-COURSE GROUPS
ALL STUDENT COURSE DATA CLASSIFIED ON PRE-COURSE GROUPS
ALL COURSES CLASSIFIED ON STUDENT COURSE GROUPS
COMPARISON OF CLASSIFICATIONS AND CHOICE OF FINAL GROUPS

step was to identify sets of courses (as opposed to variables) exhibiting strong affiliation.

The Professor Pre Course data were also analyzed using standard cluster analysis techniques and the resulting cluster groupings were compared to the course sets established by the Q factor analysis. Without becoming entwined in mathematical subtleties it should be evident that the generation of two classifications using independent mathematical procedures provides an important check on the validity of the established groups. The objective of this duplication is to ensure that the resulting classification is a product of the data as opposed to the mathematics.

The generality of the resulting Professor Pre Course based groupings was further tested by arranging student Course Evaluation data in the faculty-based group structure and subjecting the groupings to discriminant analysis. This involved matching course numbers on student and professor questionnaires using the linkage procedures described in Chapter 4.[1] (This procedure was complicated by the fact that not all courses represented in the professor Pre Course analysis were present in the student Course Evaluation study. Although both questionnaires were distributed in all sampled courses, response was totally voluntary, and at times sporadic). The resulting discrimination between groupings using student data was then compared to the original faculty based factor structure.

A second and parallel study was conducted using the student Course

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[1] See Chapter 4, pp. 4-52 to 4-57.

Evaluation data as the base point as illustrated in Figure 10.1. The objective of this second study was identical to the first; namely, to establish an underlying course categorization scheme that would effectively differentiate among courses based on change along the learning outcome dimensions. However, the procedure followed was different. The courses for which the largest number of Course Evaluation Questionnaires were available were subjected to discriminant analysis.[1] Course overlaps identified from the discriminant analysis output were then used to establish groupings based on the Course Evaluation questionnaire data.

Once the faculty and student based course groupings had been established group membership was predicted using the functions derived from both student and faculty based discriminant analyses. (Note that in both faculty and student based classifications, the final discriminant tests of course groupings use student course evaluation data input, which provides the measure of student change in learning outcomes.) The resulting predictions test the strength of each courses' affiliation to both classification schemes.

The analysis was first performed on data from the M.I.T. Sloan School. The resulting classification scheme was then tested against course specific data from the other graduate management schools.

In view of the relatively elaborate research design associated with the analysis reported in this chapter it is important not to lose sight of the objective of this investigation. At the risk of redundancy we will therefore reiterate, "our goal is to isolate a limited number of course "types" which consistently produce certain learning outcomes." This analysis is a search for underlying structures.

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[1] Mathematical constraints associated with the discriminant analysis process require that the number of responses within each course must equal or exceed the total number of courses involved in the analysis. In the case of the Sloan School analysis described below this number was 19. That is to say, there were 19 courses in which 19 or more responses were received.

The simultaneous use of Professor Pre Course and student Course Evaluation data provides a cross check on this analysis ensuring that the course classifications produced reflect consistent student and faculty perceptions. The structure emerging from this analysis should produce comparable results from both student and faculty data. After all, both are involved in the same process.

Evaluation of Professor Perceptions

The development of a course structure based on faculty intentions reported in the Professor Pre Course questionnaire involved Q factor analyses.[1] The factor analyses used in earlier chapters focused on the correlation between responses to different questions (variable) on the Pre Course Questionnaires. In preparing for this analysis the data were restructured so that each questionnaire representing a single course could be treated as a single variable. The factor analytic procedure then determined which set of faculty Pre Course responses were most similar. The factor loadings derived from this analysis indicate the strength of each course's association to a particular factor (group). A high loading indicates strong association while low loading suggests marginal classification.

Q Factor Analysis Results

Once the decision to use Q factor analysis has been made the researcher is still faced with a large number of alternative procedures. During the course of this analysis, four separate Q factor runs each using a different factorial

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[1] The term "Q factor analysis" is used to indicate that the factor analytic procedure is applied to a correlation matrix of units. The more common derivative variety "R factor analysis" focuses on the correlation between variables.

techniques were performed on the same data.[1] The factors generated by these runs are reproduced in Table 10.1 through 10.4. When a course name appears more than once, there are two or more separate sections of that course, each taught by a different instructor. An asterisk after the factor loading indicates that the course has a loading of .4000 or higher on two or more factors.

Principal Components Analysis

The initial Q factor analysis was of the principal components type. It generated 33 factors, explaining 99.9% of the variation in the data and permitted maximum expansion of the number of factors without any forcing.

Examination of the communalities associated with this initial run led to the assignment of a factor loading cutoff value of .4000[2]. Application of this cutoff criteria isolated four factors involving two or more courses. The remaining factors contained only one high ($\geq$ .4) loading course.

Table 10.1 Multi-Course Factors Produced by Initial Q Factor Analysis with .4000 Loading Cutoff

Factor 1 (10.21%)

.9272 Statistical Decision Theory
.9212 Bayesian Analysis Studies
.6756 Mathematics for Management I
.4456 Stochastic Systems
.4298 Mathematics for Management II

Factor 2 (8.87%)

.8830 Practicum in Organization Development
.8766 Human Factors in Management I
.7641 Practicum in Organization Development

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[1]The objective of this comparative analysis was to evaluate the factors produced under varying degrees of pressure beginning with generalized principal component analysis operating on the full variation of data explaining 99.9% of the total variation. Subsequent analyses forced the data into fewer and fewer factors, using principal components with an eigenvalue cutoff equal to or greater than one, reducing the number of factors further, and finally, restricting the analysis to the common variable space.

[2]This procedure is discussed in Chapter 5, pp. 5-29 to 5-30.

Factor 3 (9.46%)

.9138 Human Factors in Management II (Labor)
.8300 Human Factors in Management II (Labor)
.8056 Labor Economics
.6936 Industrial Relations Research Seminar

Factor 4 (2.78%)

.8680 Industrial Dynamics
.8567 Taxation and Business Management

Principal Components with Eigenvalue $\geq$ 1

In the second Q factor analysis of the Professor Pre-Course Data an eigenvalue $\geq$ 1 cutoff was applied in the principal component analysis. This procedure generated nine factors explaining 76% of the total variation in the data.

Table 10.2 Factors Generated by Principal Components Analysis with Eigenvalue $\geq$ 1

Factor 1 (12.72%)

-.7717 Systems Simulation
-.7356 Operations Management
-.7354 Operations Management
-.6156 Operations Planning and Control
-.6148 Management Information Technology
-.5024 Financial Administration of Industry

Factor 2 (11.62%)

.8861 Practicum in Organization Development
.8533 Practicum in Organization Developement
.8170 Human Factors in Management I
.6625 Organization
.5343 Seminar in Communications Problems

Factor 3 (11.59%)

.8522 Labor Economics
.8521 Human Factors in Management II (Labor)
.8611 Human Factors in Management II (Labor)
.7829 Industrial Relations Research Seminar
.6235 Special Studies in International Economics

Factor 4 (9.55%)

.8791 Bayesian Analysis Studies
.8521 Statistical Decision Theory
.6980 Mathematics for Management I
.5260 Stochastic Systems

Factor 5 (9.90%)

.8122 Information and Decision Systems I
.7922 Information and Decision Systems I
.7558 Financial Management
.6489 Information and Decision Systems I

Factor 6 (6.09%)

.7685 Behavioral Aspects of Planning and Control
.6940 Taxation and Business Management
.6396 Industrial Dynamics

Factor 7 (5.54%)

-.7971 Industrial Structure of Europe
-.7343 International Business Management II

Factor 8 (5.04%)

.6173 Principles of Systems

Factor 9 (4.05%)

.8947 International Communication I

Reduction Forced by 69% Eigenvalue Cutoff Criteria[1]

The third principal component analysis of the Professor Pre Course was made using an eigenvalue cutoff designed to explain 69% of the variation in the data. This run producing seven factors explaining 69% of the variation represented our first attempt to "force" the data into a limited number of categories.

Table 10.3 Factors Generated by Principal Component Analysis with Eigenvalues Cutoff to Explain 69% of the Variation

Factor 1 (18.81%)

.8736 Statistical Decision Theory
.8717 Bayesian Analysis Studies
.8620 Mathematics for Management I

[1]The eigenvalue cutoff resulted from an examination of previous factor runs, where the multi-course factors represented approximately 69% of the variation.

.7512 Mathematical Programming
.6912 Mathematics for Management II
.6622 Systems Simulation
.6485 Operations Planning and Control
.6155 Operations Management
.5412 Operations Management
.5128 Management Information Technology
.4686* Information and Decision Systems I

Factor 2 (11.65%)

.8805 Practicum in Organization Development
.8377 Practicum in Organization Development
.8086 Human Factors in Management I
.6982 Organization
.5677* Seminar in Communications Problems

Factor 3 (11.69%)

.8593 Labor Economics
.8286 Human Factors in Management II (Labor)
.8005 Industrial Relations Research Seminar
.7992 Human Factors in Management II
.6137 Special Studies in International Economics
.4974 Economic Development of the Middle East and North Africa

Factor 4 (5.73%)

-.7376 Industrial Structure of Europe
-.7271 International Business Management II
.5039 Financial Administration of Industry

Factor 5 (6.60%)

.7209 Taxation and Business Management
.8866 Industrial Dynamics
-.6622 Behavioral Aspects of Planning and Control

Factor 6 (5.38%)

.5598 Principles of Systems
.4968 International Communication I
.4966* Seminar in Communication Problems

Factor 7 (9.14%)

.7822 Information and Decision Systems I
.7626 Information and Decision Systems I
.7349 Financial Management
.6527* Information and Decision Systems I

Common Factor Analysis

The fourth run in this series used a common factor analysis of the Professor

Pre Course Data with eigenvalue ≥ 1[1]. This analysis generated six factors explaining 61% of the variation in the data.

Table 10.4 Factors Generated by Common Factor Analysis with Eigenvalues ≥ 1

Factor 1 (22.51%)

.8595 Mathematics for Management I
.7933 Bayesian Analysis Studies
.7766 Statistical Decision Theory
.7698 Mathematics for Management II
.7501 Operations Planning and Control
.7201 Stochastic Systems
.7168 Systems Simulation
.6886 Operations Management
.6556 Operations Management
.6442* Information and Decision Systems I
.6006 Financial Administration of Industry
.5601 Management Information Technology
.4989 Financial Management
.4621 Information and Decision Systems I
.4498 Information and Decision Systems I

Factor 2 (11.39%)

.8842 Practicum in Organization Development
.8207 Human Factors in Management I
.8181 Practicum in Organization Development
.6664 Organization
.5529 Seminar in Communications Problems

Factor 3 (11.49%)

.8155 Labor Economics
.7971 Human Factors in Management II
.7745 Human Factors in Management II
.7524 Industrial Relations Research Seminar
.6113 Special Studies in International Economics

Factor 4 (6.37%)

-.6435* Information and Decision Systems I
-.5800* Information and Decision Systems I
-.4938 Information and Decision Systems I
-.5231 Industrial Structure of Europe
-.4543 International Business Management

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[1]Common factor analysis is limited to the common variation in the data See Chapter 5, p. 5-29.

Factor 5 (5.81%)

.7922 Taxation and Business Management
.5715 Industrial Dynamics
-.4424 Behavioral Aspects of Planning and Control

Factor 6 (3.62%)

-.4074* Seminar in Communications Problems

Evaluation of the results presented in Tables 10.1 through 10.4 reveal that certain courses were consistently grouped together in all four analyses. Between run comparisons produced the seven pre-course factoral groupings listed in Table 10.5.

Table 10.5 Final Course Groupings Derived From Professor Pre-Course Data

Group 1 Organization Behavior

Human Factors in Management I[1]
Practicum in Organizational Development
Practicum in Organizational Development
Organization
Seminar on Communication Problems in Science and Technology

Group 2 Labor Relations

Human Factors in Management II
Human Factors in Management II
Labor Economics
Seminar in Industrial Relations

Group 3 International Business

International Business Management II
Industrial Structure of Europe

Group 4 Mathematics

Math for Management I
Math for Management II
Statistical Decision Theory
Stochastic Systems
Bayesian Analysis Studies

[1]Seven different sections were represented by one faculty Pre-Course Questionnaire. The faculty teaching the course pooled their objectives on the Pre-Course Questionnaire. In later analyses using student Course Evaluation data, there will be seven separate sections of the course.

Group 5 Operations Management

Financial Administration of Industry
Management Information Technology
Systems Simulation
Operations Management
Operations Management
Operations Planning and Control

Group 6 Introductory - General Management

Information and Decision Systems I[1]
Information and Decision Systems I
Information and Decision Systems I
Financial Management

Group 7 Management Processes

Taxation and Business Management
Industrial Dynamics
Behavioral Aspects of Planning and Control

Multiple mention of a single course title in Table 10.5 indicates data from two or more major sections of the course were included in the analysis as separate entities. In these instances each section was represented by a separate faculty member and Pre Course questionnaire.

When the factors listed in Table 10.5 are compared to traditional departmental groupings, Labor Relations, Organization Behavior and International Business emerge as clearly defined units paralleling current functional groupings. None of the other current functional or discipline oriented groups maintain an explicit identity. The noted overlap between Mathematics and Operations Research courses in Group 4 and the Systems-Operations Management linkage in Group 5 are not surprising. The isolation of all sections of the introductory management course, Information and Decision Systems I, in Group 6 along with a Financial Management course is reassuring. The primary content of this first portion of the Information Systems course is accounting oriented

[1]Three professors taught six sections of this course (two each) and each turned in one questionnaire covering both sections. In later analyses using student Course Evaluation data, there will be six separate sections of the course.

Cluster Analysis of Professor Pre-Course Data

For purposes of validation, data from the Professor Pre Course Questionnaires were also subjected to cluster analysis. The goal of this parallel evaluation was to determine whether the groupings established by the Q factorial runs could be reproduced through cluster analysis.

The cluster analysis procedure assigns each object (course) to a single group regardless of the absolute degree of association. This forced choice requirement differs markedly from the factor analysis procedure which permits a single object (course) to load on more than one factor.[1]

When using cluster analysis the researcher has the ability to specify the number of clusters or groups into which the data will classify. It should be evident that the larger the number of groups, the greater the amount of variation explained by the clusters and the less chance for inappropriate assignment. Naturally, in the limit when the number of available groups equals the number of courses all variance is explained since each course is assigned to a group consisting only of itself.

Since Q factor analysis yielded seven groups, the cluster analysis program was run three times with five, six and seven groups specified. The course clusters generated by these three runs are presented in Tables 10.6, 10.7, and 10.8. Scattergrams (plots of eigenvectors 1 and 2) associated with each run are illustrated in Figures 10.2 through 10.4. Under the conventions used to create the scattergram an 'A' indicates one or more courses in Group 1, (a'B' one or more objects in Group 2, etc.) The letter "Z" is printed when objects from two or more groups overlap. The letter used to identify each cluster in the scattergrams is noted in

[1]The cluster analysis program first performs principal component analysis reducing both the number of variables and the possibility of encountering multi-collinearity.

parentheses following the appropriate table entry. The cluster analysis program lists courses associated with each cluster in the order in which they are submitted to the program. Therefore position in the cluster group listings has no quality or extent of association implication. See Tables 10.6 to 10.8 pages 10-18 through 10-20 and Figures 10.2 to 10.4 pages 10-21 through 10-23.

Table 10.6 Course Groupings Generated By Seven Group Cluster Analysis

Cluster 1 (A)[1]

Mathematics for Management I
Mathematics for Management II
Statistical Decision Theory
Behavioral Aspects of Planning and Control

Cluster 2 (B)

Taxation and Business Management
Financial Administration of Industry
Information and Decision Systems I - 3 sections

Cluster 3 (C)

Special Studies in International Economics
Economic Development of the Middle East and North Africa

Cluster 4 (D)

International Business Management II
Industrial Structure of Europe
International Communication I

Cluster 5 (E)

Labor Economics
Industrial Relations Research Seminar
Operations Management - 2 sections
Operations Planning and Control

Cluster 6 (F)

Human Factors in Management II - (Labor) - 2 sections
Human Factors in Management I
Practicum in Organization Development
Organization
Seminar in Communications Problems
Financial Management

Cluster 7 (G)

Management Information Technology
Systems Simulation
Principles of Systems
Industrial Dynamics
Stochastic Systems
Bayesian Analysis Studies

[1] Letters in parentheses are used to identify clusters on related scattergrams, Figures 10.2 through 10.4.

Table 10.7 Course Groupings Generated by Six Group Cluster Analysis

Cluster 1 (A)

International Business Management II
Industrial Structure of Europe
International Communication I

Cluster 2 (B)

Taxation and Business Management
Financial Administration of Industry
Information and Decision Systems I - 3 sections
Management Information Technology
Systems Simulation
Principles of Systems
Industrial Dynamics
Stochastic Systems
Bayesian Analysis Studies

Cluster 3 (C)

Labor Economics
Industrial Relations Seminar
Operations Management - 2 sections
Operations Planning and Control

Cluster 4 (D)

Mathematics for Management I
Mathematics for Management II
Statistical Decision Theory
Behavioral Aspects of Planning and Control

Cluster 5 (E)

Special Studies in International Economics
Economic Development of the Middle East and North Africa

Cluster 6 (F)

Human Factors in Management II (Labor) - 2 sections
Human Factors in Management I
Practicum in Organization Development
Organization
Seminar in Communications Problems
Financial Management

Table 10.8 Course Groupings Generated by Five Group Cluster Analysis

Cluster 1 (A)

Mathematics for Management I
Mathematics for Management II
Statistical Decision Theory
Behavioral Aspects of Planning and Control

Cluster 2 (B)

Organization
Seminar in Communications Problems
Financial Management
Taxation and Business Management
Financial Administration of Industry
Information and Decision Systems I - 3 sections

Cluster 3 (C)

Management Information Technology
Systems Simulation
Principles of Systems
Industrial Dynamics
Stochastic Systems
Bayesian Analysis Studies
Labor Economics
Industrial Relations Research Seminar
Operations Management - 2 sections

Cluster 4 (D)

International Business Management
Industrial Structure of Europe
International Communications I
Human Factors in Management II (Labor) - 2 sections
Human Factors in Management I
Practicum in Organization Development

Cluster 5 (E)

Operations Planning and Control
Special Studies in International Economics
Economic Development of the Middle East and North Africa

Figure 10.2 Scattergram of Courses Positioned by Eigenvectors 1 and 2 in Five Group Cluster Analyses

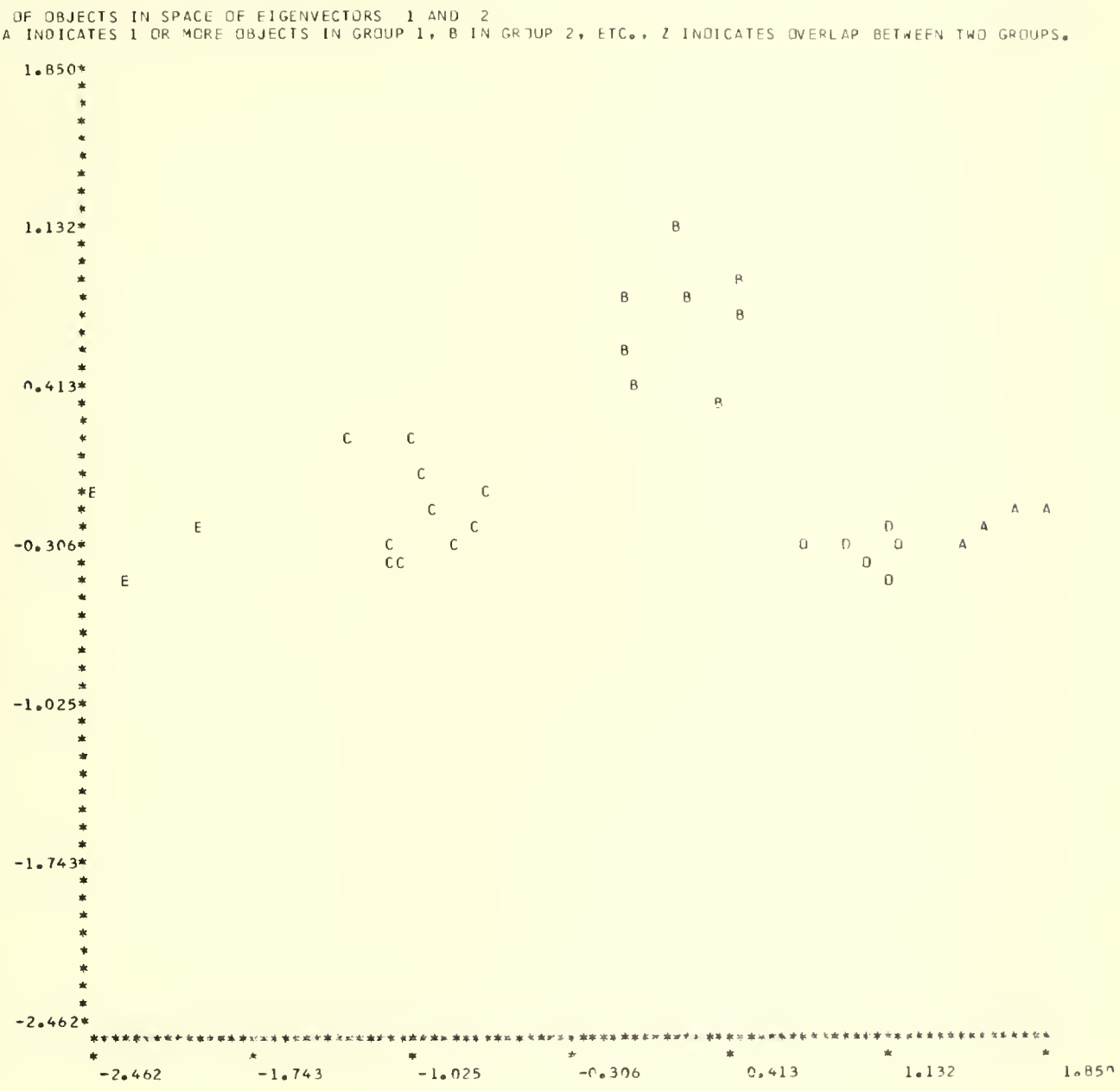


Figure 10.3 Scattergram of Courses Positioned by Eigenvectors 1 and 2 in Six Group Cluster Analyses 10-22

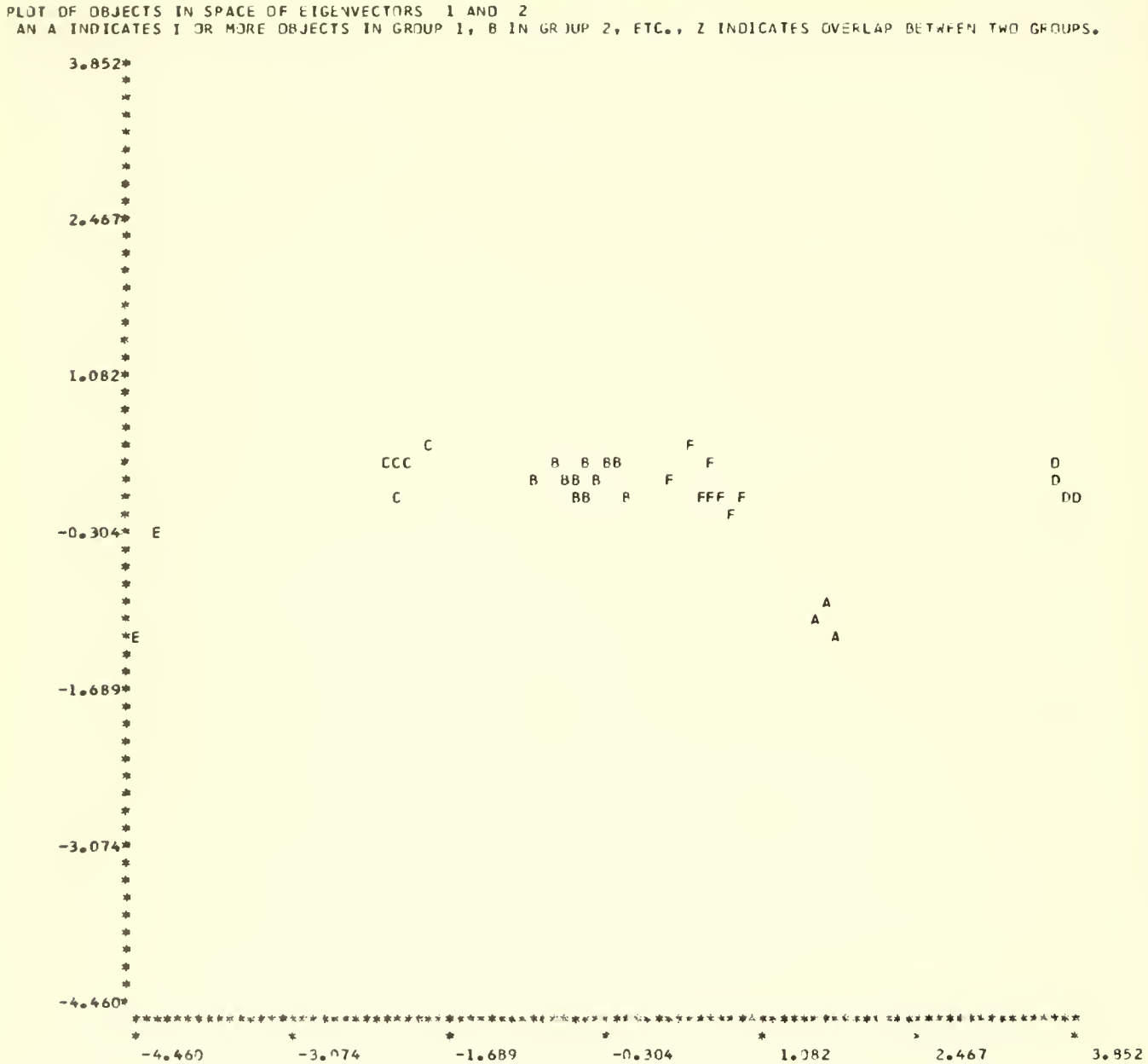
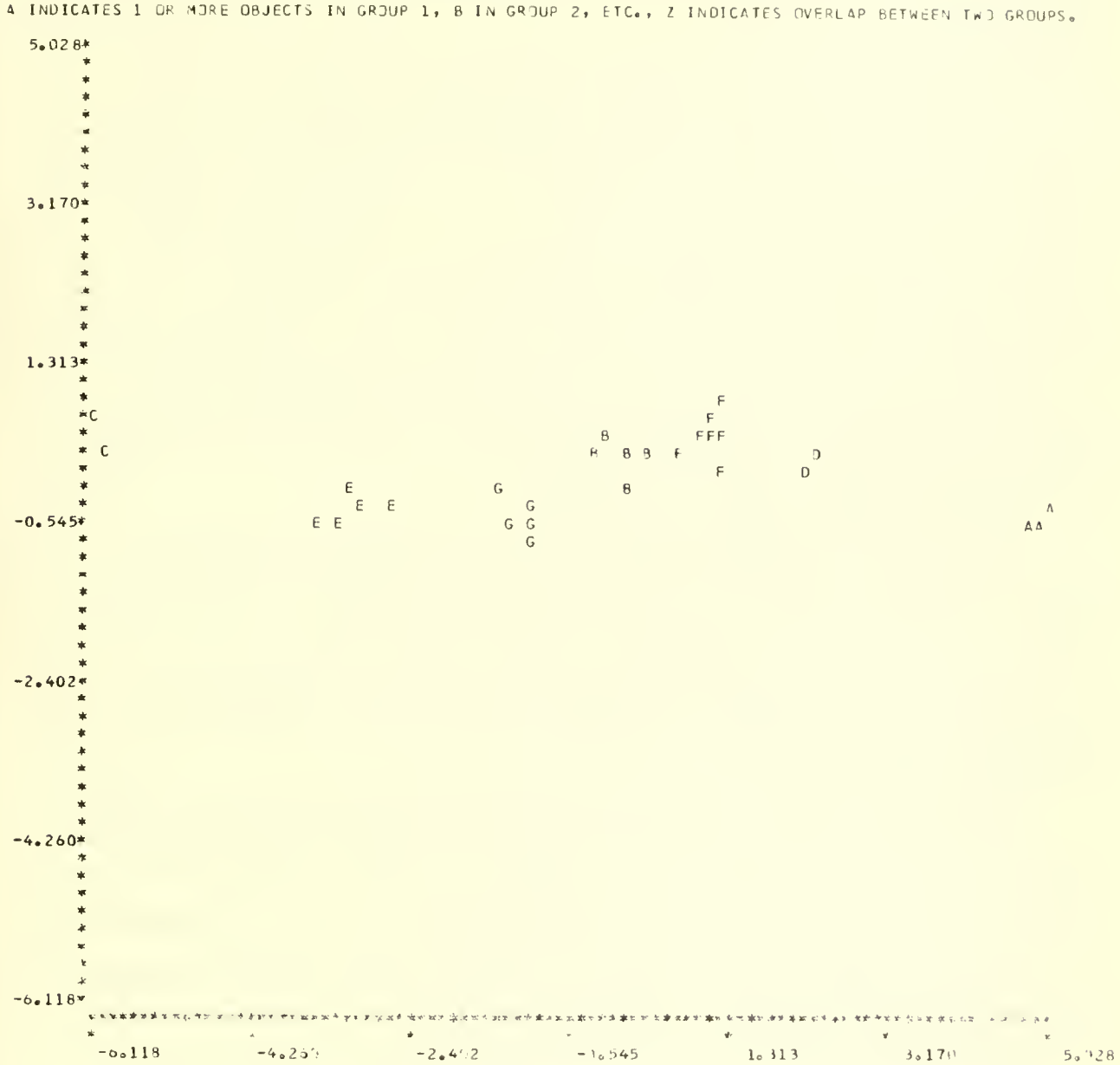


Figure 10.4 Scattergram of Courses Positioned by Eigenvectors 1 and 2 in Seven Group Cluster Analyses



The clusters produced by these runs are generally consistent with the groupings established by the earlier two factor analysis. However, several important differences among the cluster analysis and Q factor analyses runs should be noted.

Three courses from the mathematics oriented grouping (Group 4) of the factor analysis are consistently combined with a behavioral process course in a cluster appearing in all three cluster analysis runs. This cluster is made up of two sections of Mathematics for Management I, Statistical Decision Theory, and Behavioral Aspects of Planning and Control. The Planning and Control course is not associated with the mathematics subjects in the factor analysis runs although it is significantly associated with other groupings by the factor program.

Two other mathematically oriented courses, Stochastic Systems and Bayesian Analysis, linked to the other mathematical subjects in the factor analysis run, are separated from them in the cluster analysis runs and positioned with the management information, technology and management information systems courses.

The three Information and Decision Systems I sections which were consistently linked in the factor analysis runs retain their association in the cluster analysis. However, the Financial Management sections associated with the Decision Systems courses in the factor analysis is separated from them by cluster runs.

In two of the three cluster runs the International Business subjects (International Business II, Industrial Structure of Europe, and International Communication I) are isolated as a distinct cluster.

In all cluster analysis runs the Labor and Organization courses which appeared as separate factors in the earlier analysis are combined in a single cluster.

Although the groupings established by the Professor Pre-Course factor analysis were not strictly reproduced by the cluster analysis runs, parallel groupings were established.

Student Perceptions

The Pre Course data on which the preceding analysis was based reflect faculty intentions prior to beginning the classroom interactions. In contrast, the student perceptions reported in the Course Evaluation questionnaires summarized after-the-fact impressions of what actually happened within the course.

The purpose of this analysis is to test the compatibility of the faculty Pre-Course classification scheme with student post course perceptions. Only the structure grouping "similar" courses is being tested. There is no requirement that professorial intent and student perceptions be equivalent. It is only necessary for courses linked by the faculty structure to appear similar when described by student generated data.

In this test, student course descriptions were classified by the faculty based factor structure. Discriminant analysis was then used to determine the quality of discrimination among the specified groups based on reported student experience.

Labeling constraints imposed by the discriminant analysis routine required factor titles to be abbreviated as follows.

LABOR	Labor Relations
ORG. BEH.	Organization Behavior
INTL. BUS.	International Business
GEN. MGT.	Introductory Courses/General Management
MATH	Mathematics
O.R., COM.	Computers/Operations Research

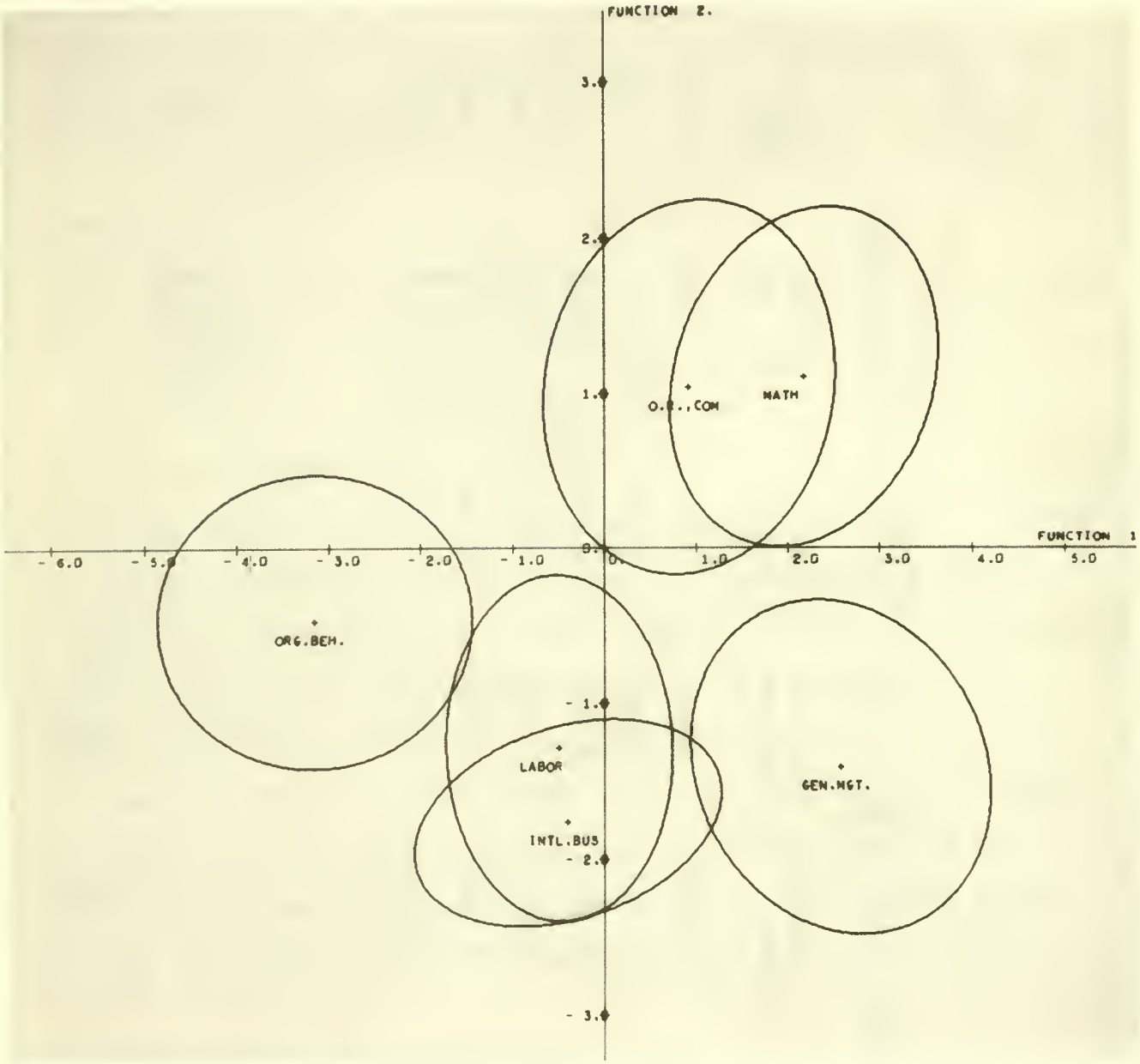
The results summarized in the Centours of Group Centroids Matrix, Table 10.9 page 10-27, and the Centour Diagram based on the resulting Discriminant Function 1 and 2, Figure 10.5 page 10-28, parallel those produced by the previous factor analysis. The greatest overlap is between the Mathematics and Operations Research/Computer groups (36.5 and 32.4 respectively). A smaller overlap links the Labor Relations and International Business sets (26.8 and 4.9). These ambiguous student perceptions reflect a similar lack of clarity in faculty intentions suggested by the factorial and cluster results of the faculty Pre-Course questionnaire. As in the faculty analysis, Organizational Behavior and General Management emerge as distinct areas.

Table 10.9

Centours of Group Centroids Matrix for
Course Evaluation Data Grouped by Professor Pre-Course Structure

Variable	Centroid Labor	Centroid Org. Beh.	Centroid Int'l. Bus.	Centroid Gen. Mgt.	Centroid Math	Centroid O.R., Com.
Labor	100.0000	7.8460	26.7578	5.5150	0.6068	2.0255
Org. Beh.	0.7319	100.0000	0.0414	0.0902	0.0792	0.7349
Intl. Bus.	4.8972	6.7261	100.0000	9.2437	0.4171	5.2406
Gen. Mgt.	0.4262	0.0738	3.3556	100.0000	5.1033	5.0390
Math	0.0839	0.0843	0.0055	5.9772	100.0000	36.5020
O.R., Com.	0.7873	1.3653	0.0040	3.9115	32.3576	100.0000

Figure 10.5 Plot of Discriminant Functions 1 and 2: Professor Pre Course Groupings Using Student Course Evaluation Data as Input



The degree of replication of the faculty based structure achieved using the student learning outcome perceptions is quite remarkable. On the basis of this discriminant result the consistently overlapping courses were combined and the six original Q factor groups were reduced to four course types; Organization Behavior; General Management; Labor/International Business; Operations Research/Computers/Math.

Independent Course Classification Based on Student Perceptions

As illustrated in Figure 10.1 the Professor Pre Course classification analysis was paralleled by a separate evaluation of student post course perceptions. The two analyses were completely independent. There was no pre-structuring of one analysis based on results from the other. This procedure was predicated on the assumption that a classification scheme founded on significant educational process differences would be replicated in analyses of both student and faculty data.

The student data were appraised in a discriminant analysis of factor scored learning outcome items from the Course Evaluation questionnaire. Under this procedure the number of observations in each course must equal or exceed the total number of courses analyzed. Nineteen courses with 19 or more responses qualified for inclusion in this run.

Several courses included in this analysis were not represented in the Pre Course evaluation since Pre Course Questionnaires had not been submitted for them.

The primary function of the plot of Discriminant Functions 1 and 2 in Figure 10.6, is to demonstrate the utility of the Centour of Group Centroids Matrix. While this figure may have possible artistic merit it is difficult to attach much diagnostic significance to this tangle of ellipses. (Course names

associated with individual ellipses have been blanked out in an attempt to improve 'clarity'. The original plot including identifying titles was even more incomprehensible.) See Figure 10.6 page 10-31.

The Centrous of Group Centroids Matrix Table 10.10, page 10-32 which provides a mathematical specification of the amount of overlap among courses, is much more easily evaluated. Seven course groups, including three single course units, emerge from this table:

Group 1 Mathematics

Mathematics for Management I (2 sections)
Mathematics for Management II
Mathematical Programming

Group 2 Labor Relations

Human Factors in Management II - Labor

Group 3 Organization Behavior

Human Factors in Management I

Group 4 Economics

Economics for Management I

Group 5 General Management

Financial Management
Information and Decision Systems I (6 separate sections)

Group 6 Operations Research

Management Information Technology (2 sections)
Mathematical Programming

Group 7 Marketing

Marketing Management

There are clear parallels between the faculty Pre-Course factors and the 19 course student post-Course discriminant analysis groupings. However some distinctions were undoubtedly created by the discriminant analysis selection requirement which favored inclusion of larger courses. One difference between the course structures produced by the two analyses is definitely attributable to this requirement. The international business courses which form a Pre-Course factor had fewer than 19 course evaluation

Figure 10.6 Plot of Discriminant Functions 1 and 2 Based on Student Course Evaluation Data Used to Establish a Course Classification Structure

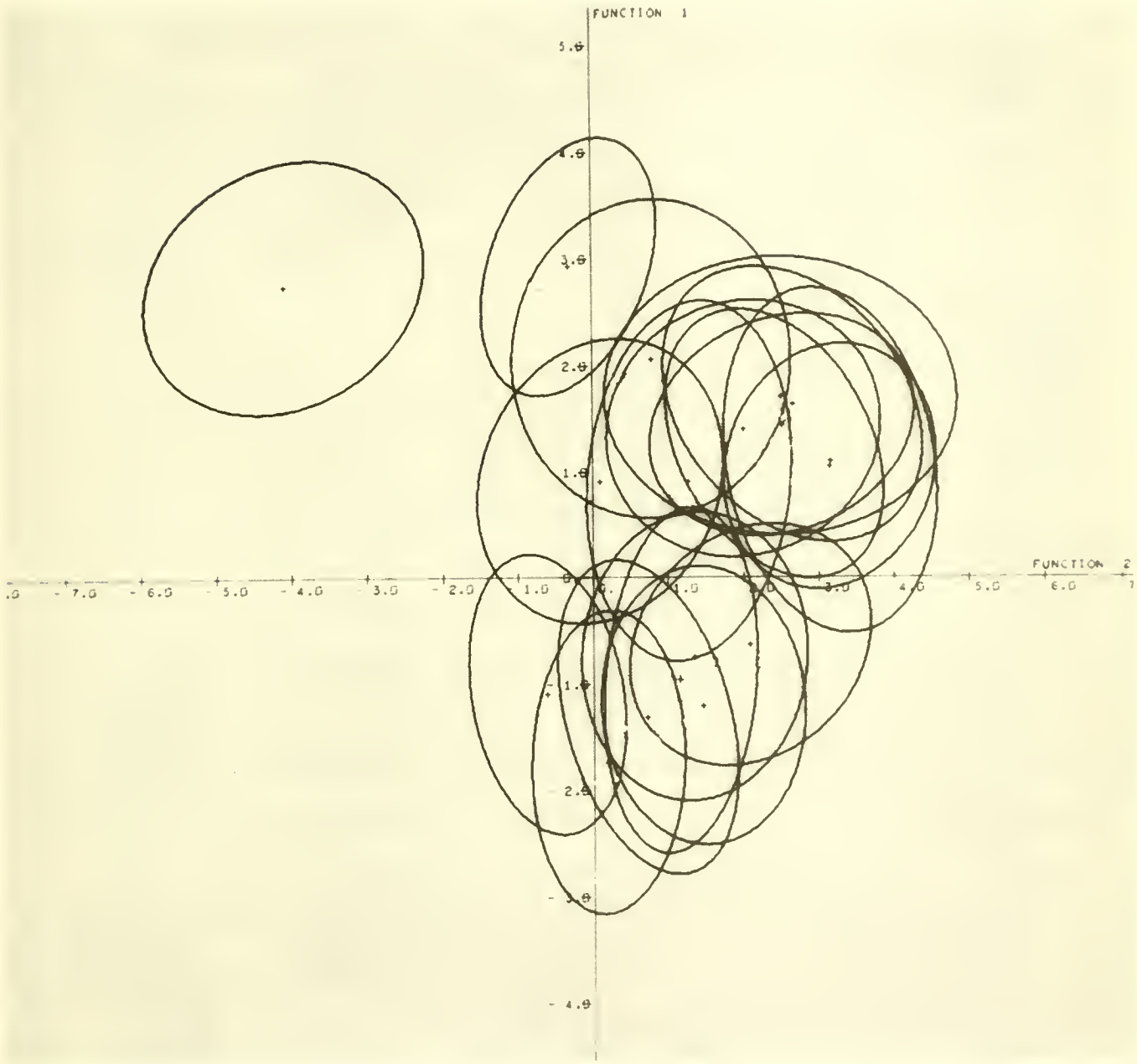


Table 10.10 Centours of Group Centroids Matrix Based on Student Course Evaluation Data Used to Establish a Course Classification Structure

	CENTROID GRP. 1	CENTROID GRP. 2	CENTROID GRP. 3	CENTROID GRP. 4	CENTROID GRP. 5	CENTROID GRP. 6	CENTROID GRP. 7	CENTROID GRP. 8	CENTROID GRP. 9	CENTROID GRP. 10	CENTROID GRP. 11	CENTROID GRP. 12	CENTROID GRP. 13	CENTROID GRP. 14	CENTROID GRP. 15	CENTROID GRP. 16	CENTROID GRP. 17	CENTROID GRP. 18	CENTROID GRP. 19
GROUP NUMBER 1 ECONOMICS FOR MANAGEMENT I	100.0000	14.4777	16.6846	0.3671	6.4449	11.6479	0.3075	4.5225	0.0597	4.6435	29.1738	0.2473	1.0116	15.8265	0.9261	0.4142	7.1573	7.0317	14.2603
GROUP NUMBER 2 MATHEMATICS FOR MANAGEMENT I	19.2773	100.0000	62.1124	24.9052	55.0299	1.0008	0.0009	2.3513	0.0160	3.9898	6.0888	5.1967	8.1043	9.4467	0.5006	8.5414	9.8575	26.0835	5.0183
GROUP NUMBER 3 MATHEMATICS FOR MANAGEMENT I	6.1919	54.9920	100.0000	38.3390	37.6932	0.0000	0.0004	1.5359	0.0138	0.5381	1.8864	3.1423	1.0469	2.9934	0.1120	9.9484	33.8226	27.4735	2.7869
GROUP NUMBER 4 MATHEMATICS FOR MANAGEMENT II	1.2236	0.3065	33.8204	100.0000	63.1852	0.0000	0.0001	0.8588	0.8653	0.5962	1.5115	5.3448	1.6956	3.1619	1.0728	9.7911	3.1147	51.2343	2.6997
GROUP NUMBER 5 MATHEMATICS FOR MANAGEMENT II	4.3593	0.9256	12.7020	54.9135	100.0000	0.0030	0.0001	0.9870	1.7592	11.1017	1.9654	15.7657	21.3799	16.6337	10.1596	7.0583	0.6101	55.3957	2.9601
GROUP NUMBER 6 HUMAN FACTORS IN MANAGEMENT II	19.1186	1.0347	1.3850	0.0558	0.0000	100.0000	3.8016	18.8748	0.1534	6.3817	2.0347	10.8756	1.6541	1.8225	11.9980	0.0001	0.2366	0.3159	9.3028
GROUP NUMBER 7 HUMAN FACTORS IN MANAGEMENT I	0.0944	0.0000	0.0072	0.0032	0.0000	0.0000	100.0000	2.0515	0.0000	0.0144	0.0001	0.6534	0.0000	0.0008	0.0330	0.0000	0.0040	0.0000	0.0075
GROUP NUMBER 8 RESEARCH MANAGEMENT	9.5317	1.0077	0.7220	1.9734	0.0324	0.0010	0.6586	100.0000	1.1578	17.1396	12.0194	35.6043	6.3455	37.4523	0.7635	0.2045	0.2193	1.9258	3.2921
GROUP NUMBER 9 FINANCIAL MANAGEMENT	8.3694	0.0012	0.0325	5.1845	2.8925	0.0000	0.0005	9.8985	100.0000	13.4879	42.4474	28.7421	13.0349	7.7951	0.8701	0.0152	0.0002	0.2060	0.7213
GROUP NUMBER 10 INFORMATION AND DECISION SYSTEMS I	7.8131	0.0004	0.0414	1.8699	0.5551	0.0000	0.0003	4.1266	40.5223	100.0000	49.4154	9.2379	67.2247	33.6768	7.0941	0.0845	0.0003	5.2075	11.0583
GROUP NUMBER 11 INFORMATION AND DECISION SYSTEMS I	24.2451	0.5499	0.4414	5.2977	4.1399	0.0003	0.0023	8.1798	36.0523	72.0709	100.0000	61.6948	50.1839	65.5992	28.3490	0.2853	0.0066	9.4246	15.6610
GROUP NUMBER 12 INFORMATION AND DECISION SYSTEMS I	9.2712	0.0005	0.0662	2.3865	0.1622	0.0000	0.0010	12.2898	34.5751	86.8806	66.6935	100.0000	66.2986	50.7569	9.3216	0.1811	0.0010	4.7691	7.8349
GROUP NUMBER 13 INFORMATION AND DECISION SYSTEMS I	6.1873	0.2207	0.1090	2.6849	4.1886	0.0000	0.0000	1.6415	9.7309	69.1317	73.4823	60.7756	100.0000	59.7774	54.1966	0.0606	0.0004	5.0024	5.1306
GROUP NUMBER 14 INFORMATION AND DECISION SYSTEMS I	27.7989	2.7304	1.6682	6.8984	1.5356	0.0046	0.0121	23.8433	18.2165	51.3826	87.0823	61.2389	55.7337	100.0000	47.8899	0.8053	0.1085	15.1827	12.7443
GROUP NUMBER 15 INFORMATION AND DECISION SYSTEMS I	10.1668	2.5455	0.6746	3.2881	0.9776	0.0001	0.0006	2.3994	2.6670	60.7941	54.1052	55.9465	70.1698	48.8934	100.0000	0.0155	0.0076	10.9042	14.7191
GROUP NUMBER 16 MANAGEMENT INFORMATION TECHNOLOGY	1.2137	0.0010	18.6779	11.7555	3.1125	0.0000	0.0001	0.1900	0.0815	0.1199	1.2698	0.8121	0.4112	0.7856	0.0168	100.0000	44.9210	37.5264	0.0883
GROUP NUMBER 17 MANAGEMENT INFORMATION TECHNOLOGY	5.7877	0.0133	18.1313	3.4166	1.4787	0.0000	0.0137	1.7442	0.1800	0.1147	1.8475	2.3801	0.1926	1.8067	0.0160	44.2612	100.0000	7.6759	0.2834
GROUP NUMBER 18 MATHEMATICAL PROGRAMMING	5.2842	0.4380	42.2720	43.2555	94.4840	0.0000	0.0004	1.5509	1.2915	2.3611	4.4164	9.0212	5.7593	7.2254	1.9442	36.8392	11.4554	100.0000	2.5451
GROUP NUMBER 19 MARKETING	5.3445	0.0381	1.9059	4.1339	6.9308	0.0000	0.0122	0.5798	9.8081	0.9562	2.6552	10.1859	1.5582	5.0437	1.0662	0.0753	0.0138	4.8214	100.0000

responses, and were subsequently excluded from the student analysis.

Groups 4 and 7 of the student based structure consist of only one course, (Economics for Management I, and Marketing, respectively), for which there were no matching Professor Pre-Course questionnaires. It was therefore impossible to include these subjects in the original faculty analysis.

Eliminating the precluded cases the discriminant analysis of student post-course evaluations validates the course structure derived from the Faculty Pre-Course analysis. The major Professor Pre-Course Groups: Mathematics, Labor, Organizational Behavior, General Management, and Operations Research/ Computers, appear as distinct and separate entities in the later student analysis. The student analysis also supports the initial factorial separation between the Mathematics and Operations Research/Computer groups which was called into question earlier.

Prediction of Group Membership by Classification Technique

Differences between discriminant Professor Pre-Course and Student Post-Course Evaluations may also be assessed using a X^2 classification technique.[1] Chi Square classification will be established for all courses for which course evaluation returns are available. Both Professor Pre-Course and Student Post Course groupings will be used. The discriminant functions delineating the six professor Pre Course groups (Labor, Organization Behavior, International Business, General Management, Mathematics and Operation Research/Computers) will first be used to classify all courses. The discriminant functions

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[1]The Prediction of Group Membership classification procedure is described on page 5-50, Chapter 5. A X^2 value is computed from the discriminant space dispersion matrix for each group and the object (student) is assigned to the group with the lowest X^2 value.

resulting from the student data-base course types will then be applied in a second and distinct classification run.

Chi Square Classification Based on Professor Pre-Course Groupings

Table 10.11 exhibits the group memberships produced when student course evaluation learning outcome responses for all courses are classified into the six Professor Pre-Course groupings. The classification routine classifies individual student responses, predicting student membership in predefined groupings. When more than 50% of the students in one course classify into the same (Pre Course) group the entire course is added to the roster for that group. Thus, if over 50% of the responses from students in the Course Human Factors in Management II are classified into the Labor group, the course becomes a member of that group.[1] The starred courses were included in the original Professor Pre-Course analysis. See Table 10.11 page 10-35.

Table 10.12 reports the results achieved when the X^2 classification procedure was applied to the groupings established by the student course evaluation analysis. As in the previous case 50% or more of the student responses must be classified into one of the established groups for the course to be classified in that group. The starred courses were members of the original student course grouping established by the discriminant analysis. See Table 10.12 page 10-36.

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[1] Courses in which responses from 50% or more of the students could not be classified into a single group were not classified.

Table 10.11

X^2 Course Classification Based on Professor Pre Course Discriminant Functions

Labor Relations

*Human Factors in Management II (two sections)
*Labor Economics

Organizational Behavior

*Human Factors in Management I (seven sections)
*Practicum in Organization Development
Seminar in Behavioral Science
*Organization

International Business

*International Business Management II
Administration, Theory and Practice

General Management

*Financial Management
*Information and Decision Systems I (six sections)
Mathematics for Management II
Management Information and Control

Mathematics

*Mathematics for Management I (two sections)
*Mathematics for Management II (two sections)
*Statistical Decision Theory
Studies in Manufacturing Analysis

Operations Research/Computers

*Management Information Technology (two sections)
*Systems Simulation
*Operations Management
New Enterprise Planning
Statistics for Model Building

*Starred courses were included in the original Professor Pre-Course analysis.

Table 10.12

X^2 Course Classification Based on Student Post Course Discriminant Functions

Economics

*Economics for Management I

Mathematics

*Mathematics for Management I (two sections)
*Mathematics for Management II (two sections) only 1 section was a member of the original group
*Mathematical Programming
Management Information Technology (1 section only)

Labor

(No courses were classified into this group by the X^2 prediction procedure).

Organization Behavior

*Human Factors in Management I (five sections were classified in this category by the X^2 analysis. Size requirements precluded all but one section from the original course evaluation discriminant analysis).

General Management

*Financial Management
*Information and Decision Systems I (six sections)
International Business Management II
Administration Theory and Practice
New Enterprise Planning

Operations Research

*Management Information Technology (two sections)

Marketing

(No courses were classified in this category by the X^2 procedure).

Courses which were members of the original established groupings may fail to achieve 50% classification of their student's responses in the X^2 prediction. This was the case for both the Labor and Marketing Courses which failed to achieve a 50% classification of student responses.

Inter-Run Comparison

Four major course groupings are consistently represented throughout the factor, cluster and discriminant runs and related classifications and, as such, appear to be representative of the most consistent underlying processes. These are:

The Organization Behavior Group consisting of:

Human Factors in Management I (7 sections)
Practicum in Organization Development
Organization
Seminar in Behavioral Science

The General Management Group consisting of:

Financial Management (2 sections)
Information and Decision Systems I (6 sections)

The Mathematics Group consisting of:

Mathematics for Management I (2 sections)
Mathematics for Management II (2 sections)
Statistical Decision Theory
Mathematical Programming

The Operations Research/Computers Group consisting of:

Management Information Technology (2 sections)
Systems Simulation
Operations Management

The Labor and International Business Groups which earlier demonstrated strong identities particularly in the Q factor analysis runs, fail to classify enough courses of sufficient size to warrant their inclusion as fundamental groupings. This situation would probably be modified if the individual labor and international relations course enrollments were more significant. However, our purpose is to generate a limited number of distinct course groupings which produce demonstrably different student learning outcomes. Therefore only the four groups with adequate membership to qualify as statistically significant will be carried into later analyses.

Prior discrepancies between the Professor Pre Course and Student Course Evaluation groupings are resolved by the X^2 classification of group membership analysis.

You will recall that the Course Evaluation based analysis produced two single course groups which were not present in the Pre Course sets: Economics and Marketing. These two sets fail to attract additional course members in either X^2 classification procedures, and cannot therefore be considered as the basis for viable aggregate course groupings based on available data.

Interpretation of Differences Between Pre Course Groups

Although two of the Pre Course groups will be omitted from further analysis due to their classification failure, they will be included in the interpretation of group differences. (Refer to Table 10.9 p. 10-27 and Figure 10.5 p. 10-28).

Functions 1 and 2 of the Pre Course discriminant analysis are responsible for 89.1% of the discriminant power in the data. Examination of the Centours of Group Centroids Matrix and the Centour diagram for functions 1 and 2 indicate some overlap between Operations Research/Computers and Mathematics groups and a very clear separation for the Organizational Development group. Labor and International Business experience overlap. General Management shows greater proximity to the quantitative groups Mathematics and Operations Research/ Computers on the Matrix of Group Centroids.

Examination of variable contributions for functions 1 and 2 confirm these observations. The following change profiles emerge for the six functional groups:

1) Organizational Development, the most independent group in the analysis, scores highest of all six groups on the Interpersonal Relations factor which consists of variables describing change in ability to communicate ideas, ability to work with people, attitudes toward people, etc. The International

Business and Labor groups also scored highly on this factor ranking second and third behind the Organizational Development group respectively. The Mathematics group falls at the far end of the spectrum, experiencing the least change along this factor. The General Management and Operations Research/Computers show relatively low change (fourth and fifth). A qualitative/quantitative pattern emerges for the Interpersonal Relations factor.

2) The six group change pattern for the Managerial Skills factor (composed of variables describing change in ability to apply techniques, ability to make decisions, ability to formulate policy, etc.), are in direct opposition to the changes on the Interpersonal Relations factor. The Mathematics group experiences the greatest change on this factor followed closely by the Operations Research/Computers group. General Management and International Business tie for third place for amount of change. The Labor group scores lower on this factor but cannot compete with Organizational Development. Organizational Development has by far the lowest change score for Management Skills.

3) General Management, which has occupied a mid ground to low change on the first two factors, scores highest on the Knowledge of Business factor, Knowledge of Business Principles and Knowledge of Management Techniques. International Business and Labor break from the qualitative/quantitative mold on this factor by recording second and third highest scores. Organizational Development has the low score. Mathematics and Operations Research/Computers record the fourth and fifth lowest scores.

4) Group responses on the one remaining learning outcome factor, Personal Insights, are relatively homogeneous indicating similar change experiences from students in all six groups. Since their scores are almost equivalent, the groups will not be ranked on this factor.

The following ranking of groups by learning outcome change scores will further illustrate the spectrum.

Learning Outcome Factors	Labor	Organizational Development	International Business	General Management	Mathematics	Operations Research/ Computers
Interpersonal Relations	3	1	2	4	6	5
Managerial Skills	5	6	3	3	1	2
Knowledge of Business Principles	3	6	2	1	4	5

Extension of the Pre Course Classification Scheme to Other Schools

While the results obtained at the Sloan School are relatively impressive we might question whether the learning process structure established there is applicable to the other institutions included in this study. The rather broad range of courses offered at the Sloan School have been reduced to six subject areas (Pre Course Groups) through a series of statistical operations. The question now becomes, "Is this Pre Course classification scheme applicable to programs outside the Sloan School?" The first step in answering this question involves examination of the course structures at the other four business schools included in the study. As in the Sloan School case, this evaluation must take account of both faculty and student perceptions of the in-class process.

The research team was extremely cautious when undertaking this analysis and treaded very carefully on the "foreign soil" of less familiar institutions. Several concerns motivated this caution. We were well aware of the pitfalls inherent in the jargon used to describe course content at particular schools. Lacking the "gut" feel for course content and pedagogy that comes from many years of association and familiarity with faculty and courses there was a danger that we might attribute M.I.T. meanings to non-Sloan vocabulary.

In addition to these qualitative concerns the analysis of data from other schools was hindered by lower level of faculty Pre-Course to student Course Evaluation linkages. The majority of these no match conditions were attributable to the faculty member filling out his Pre-Term assessment but neglecting to pass out Course Evaluation questionnaires to the students at the end of the term. In view of these difficulties, the problem of parallel structure validation was approached in a somewhat roundabout way. Professor Pre-Course responses at each school were evaluated by Q factor analysis. In addition, data from the student Course Evaluation forms were classified into the six Pre Course groupings established at the Sloan School. The Q factor analysis provided a structured summary of faculty perceptions of the courses offered at each school. The second analysis evaluated the applicability of the Sloan structure as a means of classifying data from the other schools.

Q Factor Analysis of Faculty Perceptions

The variation in number and content of courses included in the analysis for each school was an important consideration in the Q factor analysis. Only nine first year management courses were covered by the Pre-Course questionnaires submitted by Stanford professors. In contrast, Boston College faculty members provided Pre-Course evaluations for thirty subjects. The number of applicable questionnaires, resulting number of factors, and percentage of variation explained by the principal component analysis at each school is summarized in Table 10.13, page 10-42.

The resulting factors derived from each school are presented in Tables 10.14 through 10.17. Examination of these tables confirms that common elements are present in all programs. All schools exhibit comparable quantitative (Operations Research/Computers and Math-type) factors. All programs include one or more first year General Management factors. With the exception of Amos Tuck, all schools provided pre-course descriptions that

Table 10.13 Summary of Q Factor Analysis Structure at Five Graduate Schools

School	# Questionnaires	#Factors	% Variation
Boston College	30	8	73
Amos Tuck	18	6	83
SMU	25	7	72
SSM	33	9	76
Stanford	9	3	73

included clearly defined Organizational Studies or Human Factors courses. (Student data identified two courses which were clearly classified (below) as Organizational Development subjects. However, no faculty Pre-Course questionnaires were received for these courses). The extensive overlap among quantitatively oriented courses noted at the Sloan School is reproduced in the data from the other Graduate Management programs. See Tables 10.14 - 10.17 on pages 10-44 to 10-47.

Classification of Courses from Other Graduate Business Schools on Sloan Pre-Course Structure

The Q factor analysis of Professor Pre-Course questionnaires from the four participating business schools uncovered a number of structual similarities in program composition. The classification of courses from the four schools using the Sloan Pre-Course functional groupings (Labor, Organizational Development, International Business, General Management, Mathematics and Operations Research/Computers)[1] will further test for similarities between programs.

The X^2 classification of courses will be based upon the Sloan Pre-Course discriminant functions, which used student Course Evaluation learning outcome data structured in faculty-derived groups. The classifications results will be based on student learning outcome perceptions of course outcome at other schools. Thus it will be possible to compare student course reactions for similar course types. As noted earlier, the Sloan Pre-Course structure itself contains some overlap between groups and omits, from lack of sufficient data, other courses which may represent independent functional groups (e.g., marketing

[1]Although two of these groups (Labor and International Business) were dropped from further Sloan analyses due to lack of sufficient data, and failure to classify, they have been included in this analysis to provide a breadth of classification possibilities.

Table 10.14 Q Factor Analysis of Amos Tuck Professor Pre-Course Questionnaires

18 Courses represented
Principle Components Eigenvalue Cutoff of 1
83% of Variation Explained by 6 Factors

14.75%	Factor 1	Course Name
	*.6326	Computers
	*.6326	Computers
	.7528	Marketing Communications
	.8008	Marketing Research
16.97%	Factor 2	Course Name
	.8530	Business Policy
	.9438	Business Policy
	.9438	Business Policy
13.41%	Factor 3	Course Name
	.9126	International Economy
	.8798	Money Markets
	.5441	Taxation & Business Policy
14.00%	Factor 4	Course Name
	-.9155	Accounting & Finance
	-.9144	Accounting & Finance
15.79%	Factor 5	Course Name
	-.9227	Production
	-.9257	Production
	*-.5408	Quantitative Analysis
	-.5463	Quantitative Analysis
7.96%	Factor 6	Course Name
	.8384	Administration
	-.6008	Cost Accounting

*Loads at .4 or higher on another factor

Table 10.15 Q Factor Analysis of Boston College Professor Pre-Course Questionnaires

30 Courses represented
Principle Components Eigenvalue Cutoff of 1
73% of Variation explained by 8 factors

16.47%	Factor 1	Course Name
	.8497	Quantitative Analysis & Computer Science I
	.8665	Quantitative Analysis & Computer Science I
	.8685	Topics in Quantitative Managerial Economics
	.5247	Production Management
	.8023	Production Management
	*.6231	Quantitative Analysis & Computer Sciences I
	.6488	Applications of Simulation Methods
	**.5192	Management Operations-Marketing
10.92%	Factor 2	Course Name
	.6485	Industrial Psychology
	.8148	Human Factors
	.8225	Organization Studies I
	.7995	Group & Organizational Behavior
6.86%	Factor 3	Course Name
	.5185	Investment and Security
	.7962	History of Business Enterprise
13.02%	Factor 4	Course Name
	.8229	Financial Management I
	*.6641	Thesis
	*.7459	Management Information-Accounting & Control I
	*.6678	Financial Management I
	*.5587	Seminar: Business Problems and Communications
	*.5654	Management Decision Making I
7.88%	Factor 5	Course Name
	-.8532	Long Range Planning
	-.7916	Management Operations-Production
6.12%	Factor 6	Course Name
	-.8274	Distribution Management
	**.5472	Management Operations-Marketing
16.26%	Factor 7	Course Name
	.6752	Advanced Computer Programming
	.5416	Management Information, Accounting & Control I
	*.6217	Management Information, Accounting & Control I
5.75%	Factor 8	Course Name
	.6771	Computer Systems
	.6451	Distribution Management

*Loads at .4 or higher on another factor

**Loads at .5 or higher on another factor

Table 10.16 Q Factor Analysis of S.M.U. Professor Pre-Course Questionnaire

25 Courses
Principle Components Eigenvalue Cutoff of 1
72% of variation explained by 7 factors

12.52%	Factor 1	Course Name
	.8914	Public Policy and Business Decisions
	.8948	Public Policy and Business Decisions
	.5823	Seminar in Managerial Finance
	.5519	Business Law
8.43%	Factor 2	Course Name
	.8343	Interpersonal Relations in Organizations
	.8408	Behavioral Science in Personnel Management
	**.5140	Behavioral Science Concepts in Management
14.12%	Factor 3	Course Name
	.6018	Seminar in Investments
	.7327	Business Statistics
	.7768	Seminar in Quantitative Analysis
	.6233	Economics & Business Enterprise
	.7426	Quantitative Applications in Marketing Management
9.46%	Factor 4	Course Name
	-.5305	Seminar in Real Estate Development
	*-.6799	Management of Marketing Functions
	-.7184	Marketing Strategy
	**-.6489	Behavioral Science Concepts in Marketing
11.83%	Factor 5	Course Name
	-.5258	Research Methods & Report
	*-.5402	Survey of Finance
	-.9299	Managerial Finance
	-.9271	Managerial Finance
9.39%	Factor 6	Course Name
	-.6912	Managerial Accounting
	-.8199	Interdisciplinary Approach to Policy Planning
	-.7571	Managerial Accounting
6.24%	Factor 7	Course Name
	-.6105	Problems & Research in Real Estate
	.7591	Contemporary Accounting I

*Loads at .4 or higher on another factor

**Loads at .5 or higher on another factor

Table 10.17 Q Factor Analysis of Stanford Professor Pre-Course Questionnaires

9 Courses
Principle Components Eigenvalue Cutoff of 1
73% of variation explained by 3 factors

34.83%	Factor 1	Course Name
	.7190	Management Accounting I
	.8774	Operations and Systems Analysis I
	.8267	Operations and Systems Analysis I
	.6978	Management and the Computer
	.7140	Management Accounting I
19.42%	Factor 2	Course Name
	.8936	Organizational Behavior I
	.9431	Organizational Behavior I
19.20%	Factor 3	Course Name
	.8320	Business Economics I
	.8939	Business Economics I

and economics.)

Two constraints on the data reduced the number of courses from other schools that could be classified. The first is familiar - all incomplete responses (for instance where a student fails to answer all learning outcome dimensions) were rejected. Secondly, lacking the course enrollment figures for some schools, all courses represented by less than ten student responses were omitted for fear that the classification would be arbitrary.

Fifty-four courses from the four participating schools were classified. The breakdown of courses per school is as follows:

Amos Tuck 18

Boston College 21

SMU 5

Stanford 10

SMU data suffers the most from the qualification procedure, especially the requirement of ten or more complete responses per course. Course classifications will be described by school.

Six of eighteen courses at Amos Tuck classify clearly into Sloan groupings all three "Computers" sections fall into the Sloan Operations Research/Computers group; two "Quantitative Analysis" sections classify with the Sloan Mathematics group; and one section of "Business Policy" classifies with General Management. Also, another section of Business Policy classifies 10 of 21 responses into the General Management category - a near miss. The Computers and Quantitative Analysis classifications represent a clear fit between course types. Business Policy, however, requires a comparison of catalogue definitions for explication. See Table 10.18 page 10-49.

The Amos Tuck catalogue describes the Business Policy course thusly:

Table 10.18 Amos Tuck Courses Classified on Sloan Pre Course Structure

Amos Tuck	Labor	Organizational Development	International Business	General Management	Mathematics	Operations Research/ Computers	Total
Accounting: Finance	8	0	2	3	3	1	17
Administration	14	21	5	3	1	3	47
Administration	8	6	4	3	4	2	27
Administration	7	8	1	1	1	1	19
Computers	0	0	0	0	7	8	15
Computers	2	0	0	0	2	8	12
Computers	1	0	0	0	2	7	10
Production	4	3	6	13	10	10	46
Production	2	2	3	7	12	8	34
Quantitative Analysis	2	1	0	3	16	3	25
Quantitative Analysis	2	1	0	8	14	5	30
Business Policy	3	0	4	10	1	3	21
Business Policy	0	1	5	12	0	0	18
Cost Accounting	3	2	3	16	3	7	34
International Economy	6	1	2	3	1	3	16
Marketing Communications	5	0	7	6	1	6	25
Money Markets	8	2	2	3	2	4	21
Taxation and Business Policy	2	1	3	10	4	5	25

> The objectives of the Business Policy course are: (1) to acquaint the student with the viewpoint of top managers in complex organizations, (2) to give him significant exposure to the major issues involved in planning, organizing, and controlling complex organizations, (3) to help him integrate the specific analytical apparatus and view points of functional fields into a larger view of the overall organization's purposes, (4) to introduce the student to certain strategic activities uniquely located at the top managerial level, including long range planning, research and development, corporate development, and acquisition and merger activities.

The Sloan General Management group is composed of six sections of the Information and Decision Systems I course described below.

> Introduction to basic concepts and techniques of collecting, processing and reporting information generated by various organizations. Emphasis on basic financial and management accounting concepts. Introduction to computers and techniques of financial decision making. Examination of the organizational goal structure and decision-making process which determines information needs.

Only the final line of the Information and Decision Systems course description seems to relate to the Business Policy course.

Two other interesting course parallels - or near-miss classifications - merit attention:

1) 16 of 34 students in Amos Tuck's Cost Accounting course classify with the Sloan General Management Group. A significant portion of the Information and Decision Systems I courses (see description above) deal with accounting matters. It is interesting to note that Tuck's Accounting and Finance course shows no similarity with the General Management category.

2) All three sections of Administration classify the majority of responses into the Sloan Labor and Organizational Development groups. The Amos Tuck catalogue description of the Administration course below encompasses a number of objectives present in the Organizational Development courses at Sloan.

> This course is designed to study the various processes of organizing, motivating, directing, appraising, and coordinating the efforts of people engaged in purposeful activities. A wide variety of actual business cases and research reports provides the basis for class discussion and written work. There is continuous practice in the art of diagnosis and the prescription of appropriate programs of action to meet specific problems. Emphasis is placed on the student's ability to develop and verify personally useful concepts for understanding human behavior in an organizational context, toward the goal of becoming increasingly aware, responsible, and creative as a future administrator.

This pattern of classifying a significant number of students into both Labor and Organizational Development groups, although not significant by itself, is mentioned because it appears in later Boston College and S.M.U. classifications.

Of the twenty-one Boston College courses classified, only three place a majority of their membership in Sloan categories (see Table 10.19 p.10-52): Human Factors clearly falls within the Organizational Development sphere; Management Information Accounting and Control classifies with General Management as does Mergers and Acquisitions. The first two matches make intuitive sense, the third is somewhat mysterious. Unfortunately, Boston College was in the process of putting together a new catalogue during the fall of 1969, and specific course descriptions were unavailable. There are a few other comments that can be made:

1) Boston College's "Industrial Relations" course shows a clear split between the Sloan Organizational Development and Labor areas.

2) The two "Problems of Administration in Changing Environments" courses show some relationship to Sloan Labor and International Business categories.

3) All three Boston College computer oriented courses (two sections of Quantitative Analysis and Computer Sciences I and Computer Systems) fail to classify with Sloan Mathematics and Operations Research/Computers categories.

Only five courses at S.M.U. met the X^2 classification requirements. Of these five, only one clear classification resulted (see Table 10.20 p.10-53): Five of ten students in Managerial Accounting were assigned to the Sloan General

Table 10.19 Boston College Courses Classified on the Sloan Pre Course Structure

Boston College	Labor	Organizational Development	International Business	General Management	Math-ematics	Operations Research/ Computers	Total
Financial Management I	5	3	3	22	2	14	49
Production Management	3	2	4	4	2	3	18
Human Factors	0	13	0	0	0	2	15
Management Decision Making I	1	4	7	1	0	3	16
Management Decision Making I	2	9	8	7	4	7	37
Management Decision Making I	0	5	7	6	3	0	21
Problems of Administration in Changing Environments	12	6	13	10	1	5	47
Problems of Administration in Changing Environments	11	4	4	3	0	2	24
Management Information Accounting and Control I	3	3	5	16	0	5	32
Management Operations-Marketing	0	2	2	6	1	2	13
Quantitative Analysis and Computer Sciences I	2	5	0	6	5	4	22
Quantitative Analysis and Computer Sciences I	1	4	2	2	2	7	18
Organization Studies I	1	3	4	3	0	2	13
Industrial Relations	7	0	7	1	0	0	15
Cultural Influences on International Business	3	3	2	2	0	0	10
The Role of Systems Analysis in Management	1	2	1	2	1	4	11
Investment and Security Analysis	6	2	10	18	5	7	48
Computer Systems	3	2	4	3	1	6	19
Industrial Psychology	1	1	6	3	1	2	14
Seminar: Business Problems and Communications	0	3	1	2	2	3	11
Mergers and Acquisitions	0	2	12	22	1	6	43

Table 10.20 S.M.U. Courses Classified on the Sloan Pre Course Structure

S.M.U.	Labor	Organiational Development	International Business	General Management	Mathematics	Operations Research/ Computers	Total
Managerial Finance 011/01	4	0	2	3	0	3	12
Managerial Accounting 031/02	1	0	1	5	0	3	10
Public Policy and Business Decisions 051/02	5	1	3	4	0	1	14
Interdisciplinary Applications to Policy Planning 091/02	3	2	5	2	2	1	15
Behavioral Science in Personnel Management	4	3	1	0	0	3	11

Management category. The majority of students in the SMU Behavioral Science in Personnel Management course are divided between the Sloan Labor and Organizational Development categories - a relationship noted at other schools.

Four of ten Stanford courses classify directly into Sloan categories (see Table 10.21 p. 10-55): two sections of Management Accounting I classify as General Management courses, and two sections of Organizational Behavior I fall into the Sloan Organizational Development category.

Although the two sections of Management and the Computer are not classified into the Sloan Operations Research/Computer category, the majority of students are assigned to the quantitative areas (Mathematics and Operations Research/Computers). A similar result is apparent with the Operations and Systems Analyses I sections. Business Economics I classifications are chaotic, suggesting that the course represents a dimension not included in the Sloan scheme. The catalogue description of Business Economics I verifies this suspicion:

> The focus of Economics I is on business decision-making within the firm, on the behavior of individual markets reacting to supply and demand forces and on the consequences of alternative market structures and business policies. Specific topics include supply and demand analysis, consumer behavior, theory of cost and production, pricing and competition, factor pricing and the concepts of marginal analysis.
>
> The emphasis in Business 201 is on the macro, or aggregative aspects of the economy. Specific topics include national income accounts, the determination of the level of aggregate output, employment and prices; the monetary system, including the effects of monetary policy; economic growth; and international monetary economics.

Because of lack of data, Sloan economics courses were not represented in the functional scheme.

Table 10.21 Stanford Courses Classified on the Sloan Pre Course Structure

Stanford	Labor	Organizational Development	International Business	General Management	Mathematics	Operations Research/ Computers	Total
Business Economics I	19	4	6	10	2	4	45
Business Economics I	4	4	2	11	3	8	32
Management Accounting I	3	0	1	23	2	2	31
Management Accounting I	2	1	1	37	7	6	54
Management and the Computer	0	0	2	3	5	5	15
Management and the Computer	2	5	0	11	12	13	43
Operations and Systems Analysis I	1	0	1	6	8	3	19
Operations and Systems Analysis I	2	1	0	15	17	6	41
Organizational Behavior I	2	14	5	3	3	0	27
Organizational Behavior I	2	25	5	2	6	4	44

Cross-School Classification Conclusions

The Sloan Organizational Development and General Management categories appear to be the most clearly generalizable learning process groups based on data from other business schools. Both categories attract majority membership from similar course types at the other schools. As noted in the preceding discussion, a number of Labor and Organizational Development courses at other schools produce similar course outcome responses, indicating overlaps which were not present at Sloan. Although the Mathematics and Operations Research/ Computer groups attract similar courses at other schools, the finer distinction between quantitative courses noted at Sloan becomes somewhat muddied. The Sloan International Business category generally fails to attract courses from other schools.

Chapter 11

Measuring the Educational Product

"Education should be as gradual as the moon rise,
perceptible not in progress but in result."[1]

The analysis completed in Chapter 10 demonstrated that the course offerings at the Sloan School could be classified into six relatively distinct subject groupings: Organizational Development, General Management, Mathematics, Operations Research/Computers, International Business, and Labor. The last two groupings were eliminated in the final classification step since the Labor group failed to pass the chi square classification test and the International Business groupings suffered from lack of sufficient data.

The remaining four groups are fairly consistent from the point of view of participating faculty and students. As such they provide the first step toward the description of the educational process. The objective now is to learn more about the nature of the process within each of the relatively homogeneous course groupings.

It is obvious that students entering each type of course have varying expectations, experiences and capabilities. It is also clear that they may react differently to the material presented, the mode of presentation, the classroom environment, or the professor's personality. It might be hypothesized that these student differences account for the slight overlap between the major course groupings. That is, strong underlying student reaction patterns may cloud the classification between major subject sets. It is important to remember, however, that our objective is to isolate and analyze student

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[1]George John Whyte-Melville, "Riding Recollections."

learning experiences. Subjective student predispositions and reaction patterns are a legitimate part of the process to be evaluated.

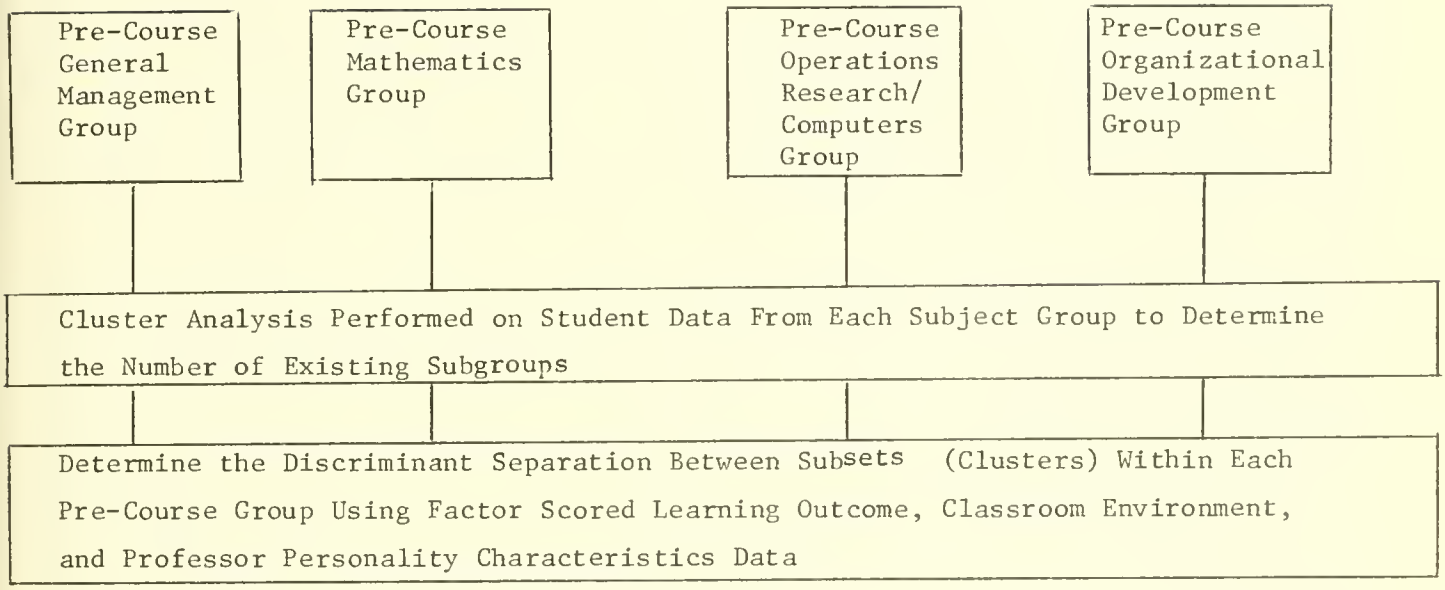
We will start by looking at the student learning outcome responses within each subject group. The appropriate data from the Course Evaluation questionnaires will be cluster analyzed in an attempt to isolate significant subgroups within each subject set. In the search for different response patterns within functional areas, two objectives must be kept in mind. First the sample size within each subgroup should be kept to a reasonable size -- subgroups involving a limited number of students should be avoided -- and second, the subgroups established should be clearly independent. The objective is to identify a limited set of significant groups (involving sufficiently large samples of students) in clearly differentiated learning situations.

The sample size issue is particularly crucial since the final populations sets within each of the four subject classifications are not large: Organizational Development 55, Mathematics 65, Operations Research/Computers 48, and General Management 134. Original population sizes were substantially larger. However, students who failed to respond to one of the questions analyzed or could not be matched to a Pre Term questionnaire were omitted from the sample used in this analysis. The Pre Term questionnaire linkage is required to support further analysis of student attributes and predispositions once the educational process sub units have been established based on the learning outcome responses from the Course Evaluation questionnaires.

The actual procedures followed in this analysis are summarized on page 11-3 in Figure 11.1. Course Evaluation responses from students associated with each major subject grouping will be cluster analyzed in an attempt to isolate

Figure 11.1

Summary of Within Subject Group
Analytic Sequence


Pre-Course General Management Group
Pre-Course Mathematics Group
Pre-Course Operations Research/ Computers Group
Pre-Course Organizational Development Group
Cluster Analysis Performed on Student Data From Each Subject Group to Determine the Number of Existing Subgroups
Determine the Discriminant Separation Between Subsets (Clusters) Within Each Pre-Course Group Using Factor Scored Learning Outcome, Classroom Environment, and Professor Personality Characteristics Data

those students reporting similar experiences within a particular course type. The independence of these learning process sub groups will then be tested by applying discriminant analysis to the factor scored learning outcome, classroom environment, and professor personality characteristic data.

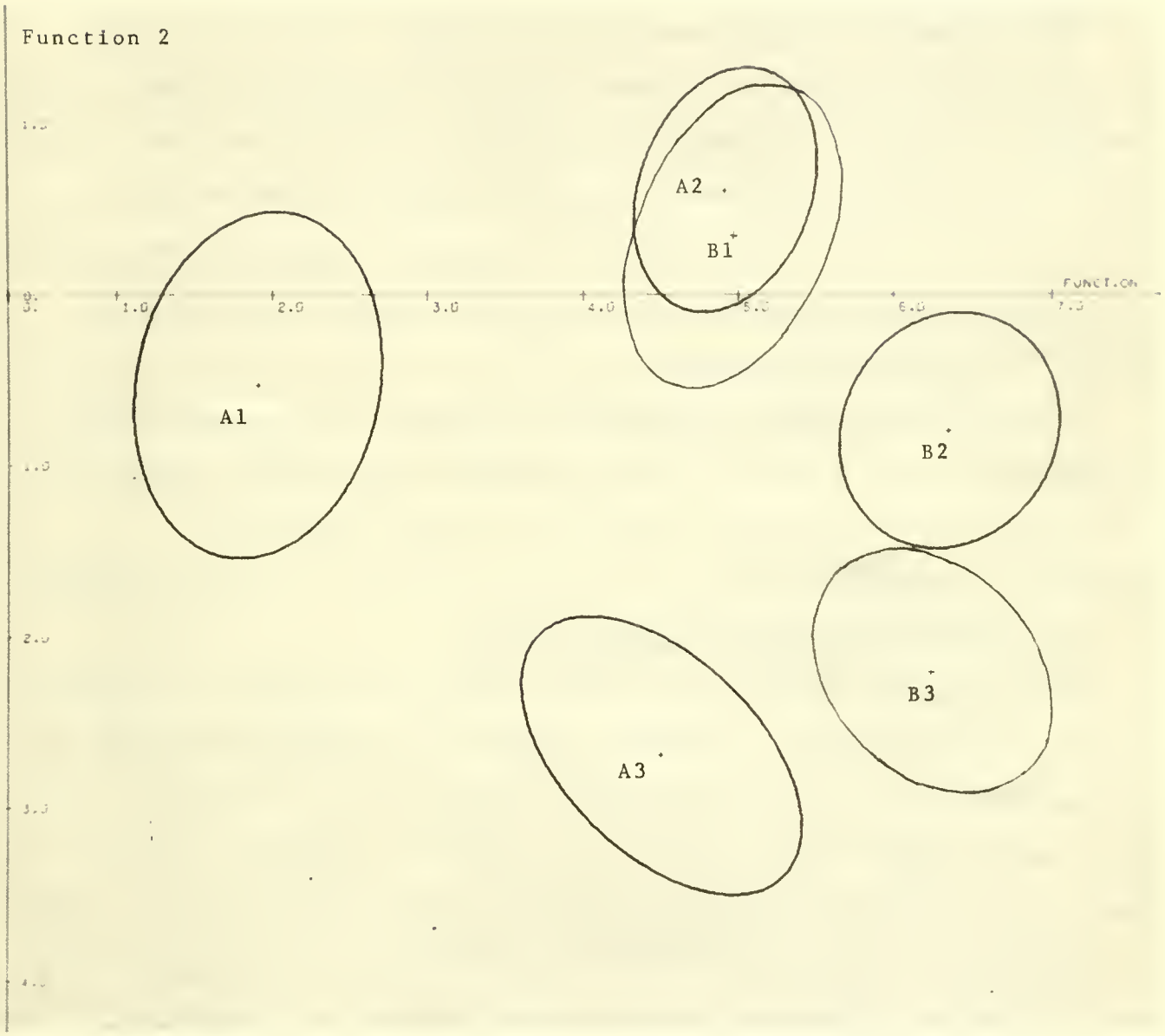
Once the validity of the student subsets within each subject grouping has been established, data from all of the student subsets across subject groupings will be combined in a single analysis. The objective of this cross-subject discriminant analysis will be to identify similar student learning process subgroups within different course types.

A hypothetical example may help to resolve the confusion associated with discussions of groups and subgroups. Assume that we have three student learning process subgroups (A1, A2, and A3) within functional subject group A. Assume further that three subgroups (B1, B2, and B3) have been established by an analysis of the responses associated with course type B. It is possible that the students classified A2 in subject group A may have learning outcome perceptions quite similar to those exhibited by a student subset associated with course type B, say for example, B1.

If this were the case we would expect a discriminant analysis to show an overlap between groups A2 and B1 of the type illustrated in Figure 11.2 on page 11-5.

The analyses presented in this chapter involve two new data sets from the Course Evaluation questionnaire in addition to the learning outcome responses on which the Chapter 10 analysis was based. The two new variable sets are the classroom environment descriptors, and student perceptions of faculty personality characteristics. These two measures of student perceived classroom experiences, in addition to the learning outcome dimensions, will be the basis for the student learning process analysis. All three data sets

Figure 11.2 Hypothetical Student Learning Process Overlap Between Subject Groups



have been reduced by factor analysis.[1] All three data sets are therefore represented by factor scores which provide the input to the cluster and discriminant analysis runs.

The discriminant analysis comparison of subgroups associated with the four major course groupings may indicate overlap between learning process subgroups. If this is the case, the previously established course type classifications will be refined and a new set of learning outcome groups will be proposed based on these overlaps. Discriminant analysis and group classification procedures will be used to test the viability of these new restructured learning outcome groups.

Once the final student learning process subgroups have been established we will turn to data from the Pre Term questionnaire and attempt to explain the differences among subgroups on the basis of student expectations, attitudes and background.

Sub Group Classification by Cluster Analysis

As illustrated in Figure 11.1 the first step in the evaluation procedure requires a cluster analysis of the factor scored Course Evaluation learning outcome data generated by students in courses linked to each of the four major subject groups. It is important to recognize that responses for each subject group were considered separately in this portion of the analysis.

Examination of the results of these analyses reveals that students in the Organizational Development subject area maybe separated into four groups while responses from Mathematics, General Management and Operations Research/ Computer groups each produced three learning process subgroups.

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[1] Reference Chapter 5 description of factors developed based on each data set.

Figures 11.3 through 11.6 contain the scattergrams produced by the cluster analyses of the Mathematics, General Management, Operations Research/Computers and Organizational Development subject groups respectively.

Examination of these figures reveals that the subgroups produced by the analysis meet the fundamental requirements noted in the introduction to this chapter. Specifically, the learning process subgroups are relatively large and distinct. There are no absolute overlaps among group members (no Z's plotted in the diagrams). See pages 11-8 through 11-11.

While the cluster analysis groups appear to be distinct, we will test the actual significance of their separation by performing discriminant analyses on the data for students within each major subject area using the groups created by the cluster analysis.

Discriminant Analysis of Student Subgroups Within Subject Areas

The second step of the process illustrated in Figure 11.1 involves analyzing the factor scored learning outcome data associated with the student learning process subgroups to determine the degree of separation between groups. The Centour of Group Centroid Matrices generated by the analysis of the General Management, Mathematics, Operations Research/Computer and Organizational Development data are presented in Tables 11.1 through 11.4 respectively. The results summarized in these matrices clearly substantiate the conclusion based on the scattergram displays. The subgroups identified within each major subject grouping are distinct and separate. There are no significant overlaps among the student learning process subgroups established within each major subject type. See pages 11-12 through 11-15.

The process illustrated in Figure 11.1 is complete. We have identified thirteen student learning processes within the four subject groupings and established the validity of this classification structure. The question still

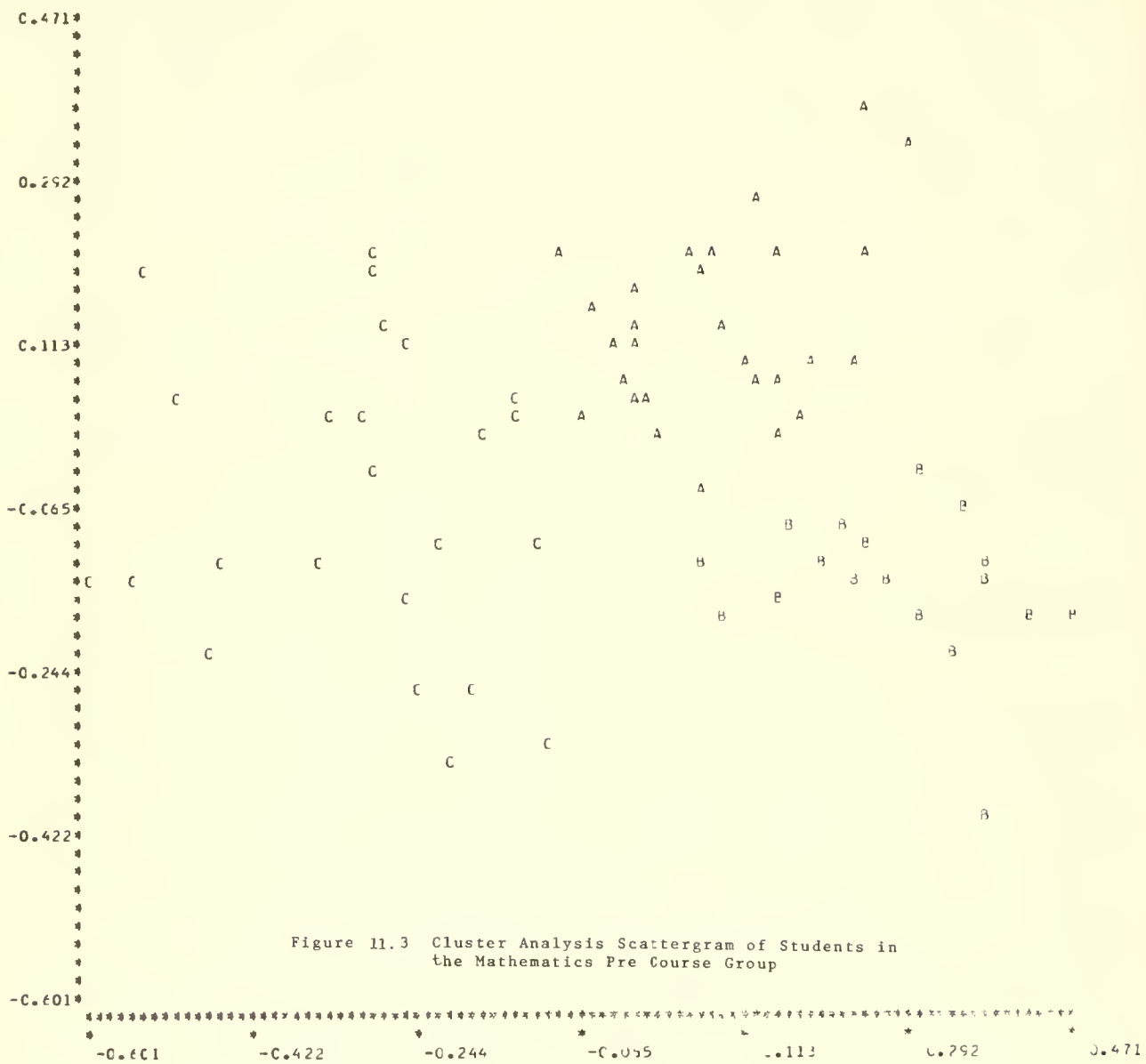


Figure 11.3 Cluster Analysis Scattergram of Students in the Mathematics Pre Course Group

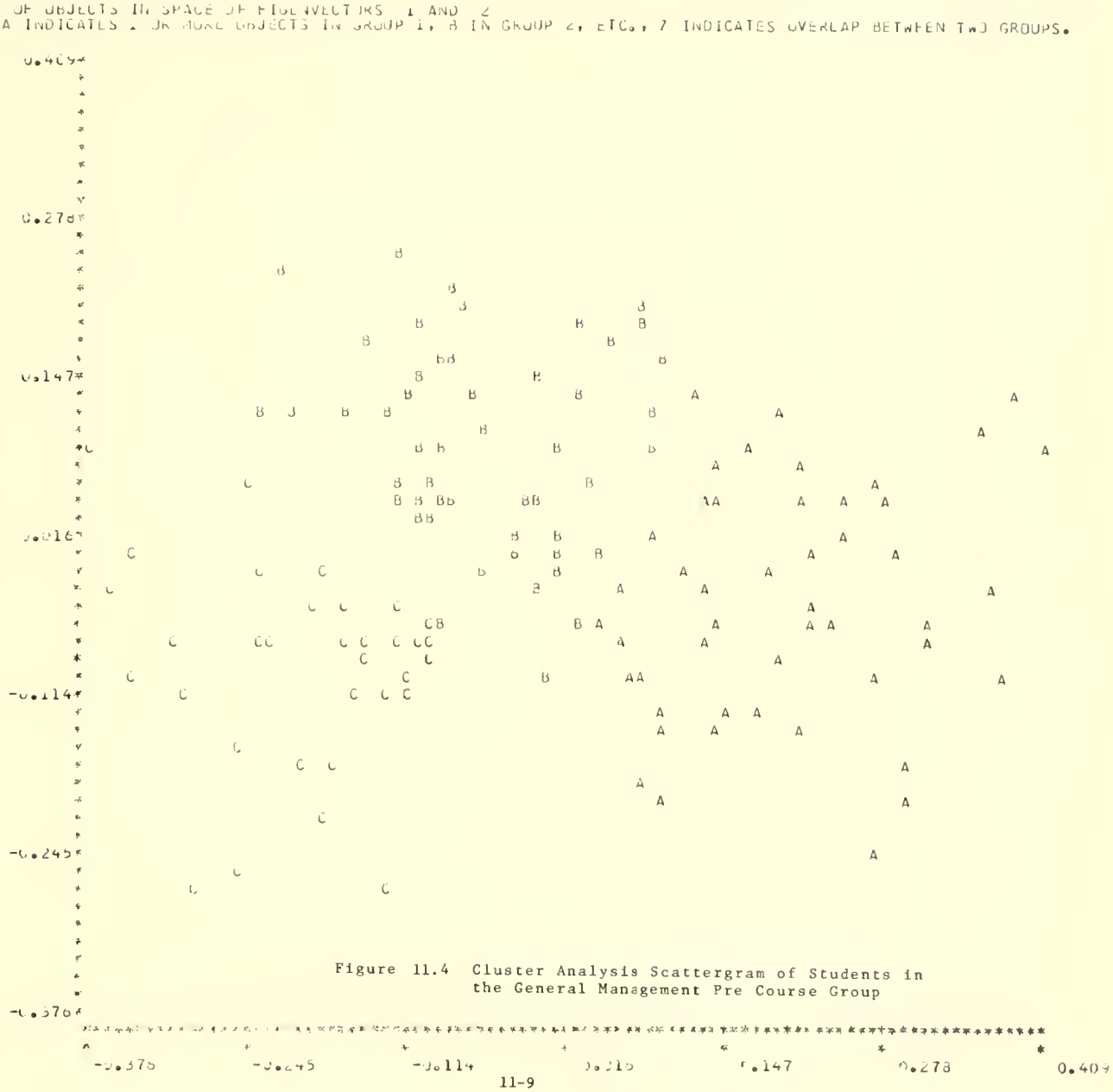


Figure 11.4 Cluster Analysis Scattergram of Students in the General Management Pre Course Group

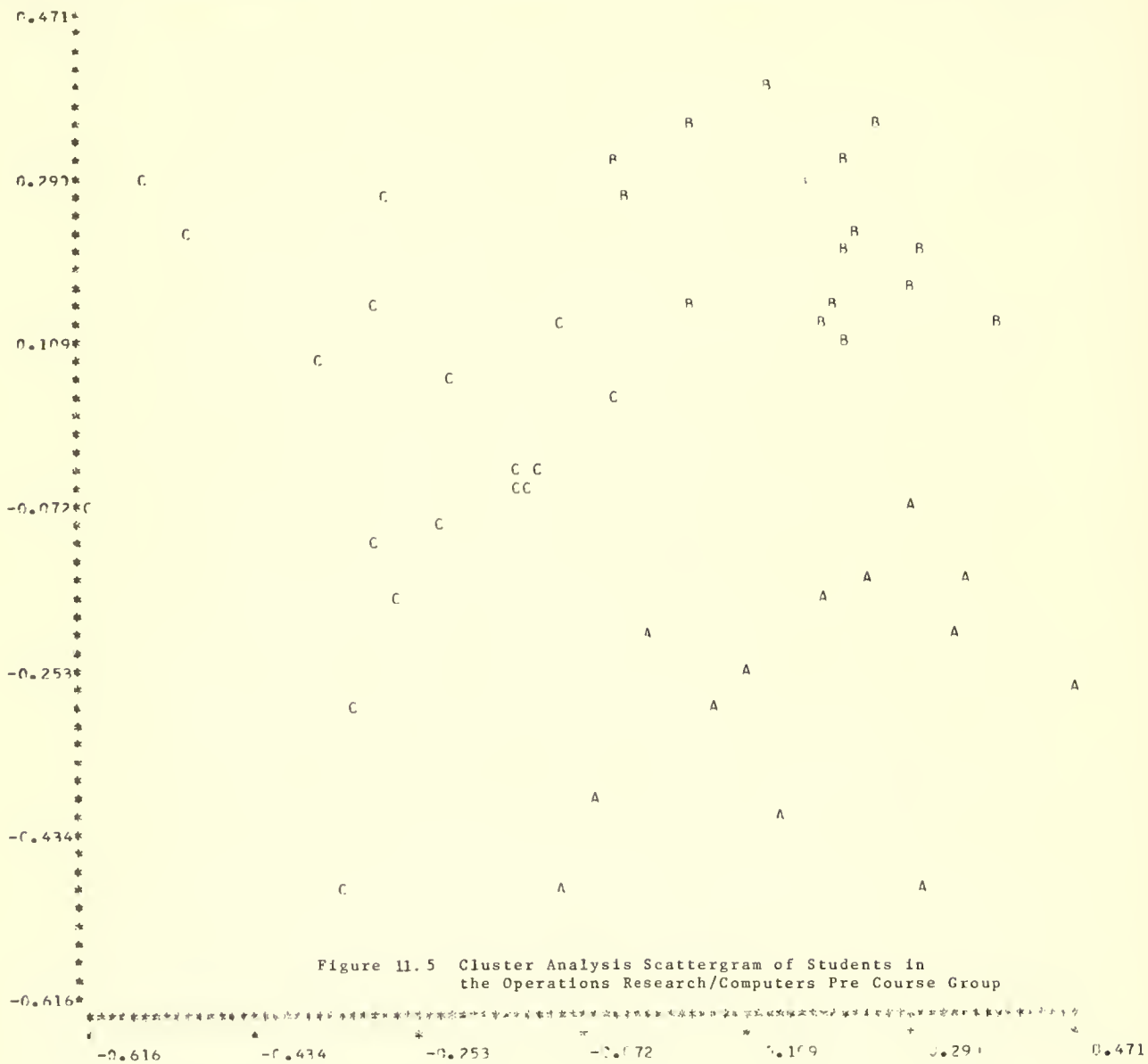


Figure 11.5 Cluster Analysis Scattergram of Students in the Operations Research/Computers Pre Course Group

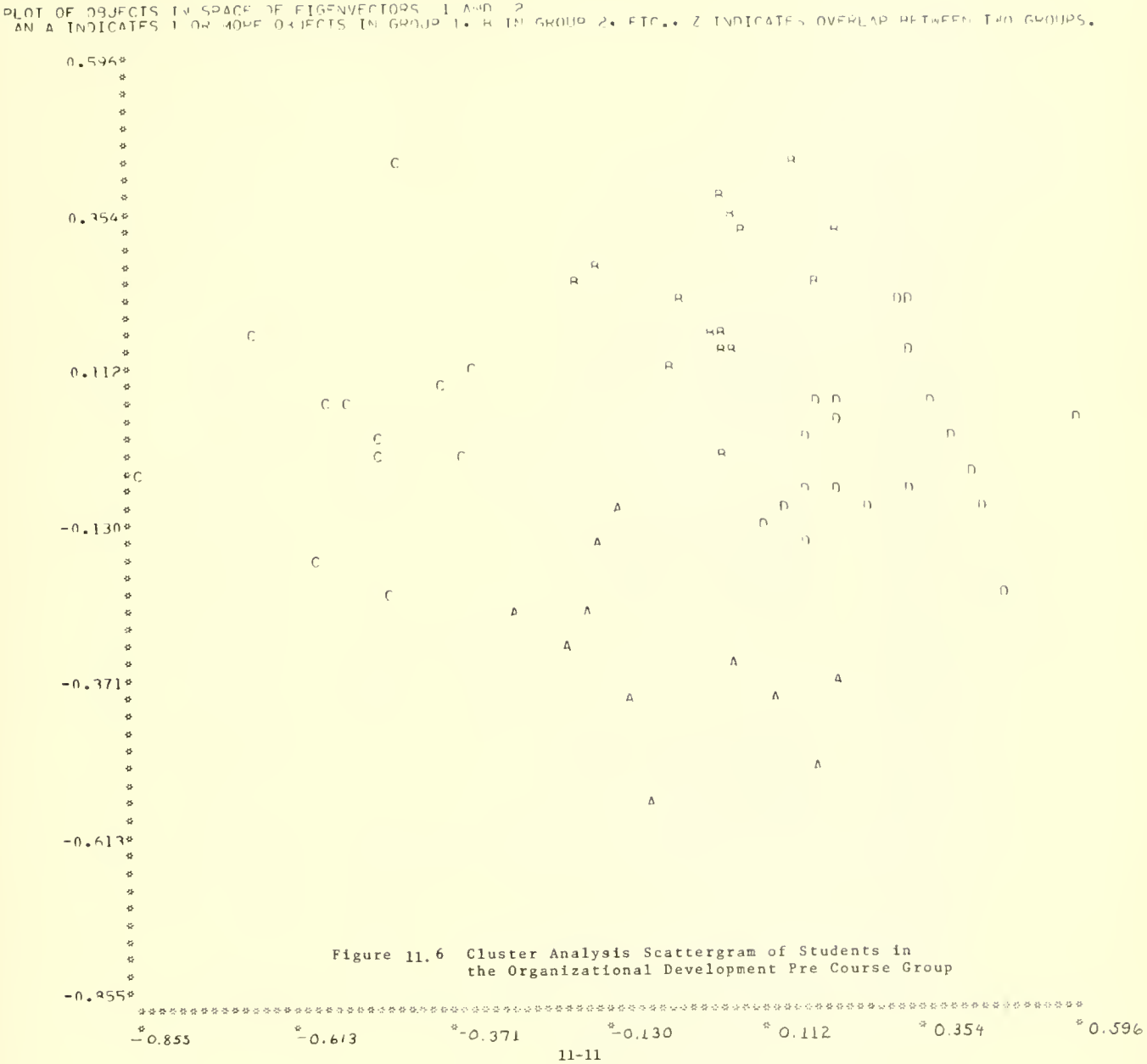


Figure 11.6 Cluster Analysis Scattergram of Students in the Organizational Development Pre Course Group

Table 11.1

Centours of Group Centroids Matrix

Produced by Discriminant Analysis of Student Learning

Process Subgroups Within the General Management Subject Group

VARIABLE	CENTROID Cluster 1	CENTROID Cluster 2	CENTROID Cluster 3
Cluster 1	100.0000	0.5002	0.0004
Cluster 2	0.5516	100.0000	0.8506
Cluster 3	0.0206	0.6226	100.0000

Table 11.2

Centours of Group Centroids Matrix

Produced by Discriminant Analysis of Student Learning

Process Subgroups Within the Mathematics Subject Group

VARIABLE	CENTROID Cluster 1	CENTROID Cluster 2	CENTROID Cluster 3
Cluster 1	100.0000	0.1051	0.9746
Cluster 2	0.0149	100.0000	0.0420
Cluster 3	0.0522	0.0001	100.0000

Table 11.3

Centours of Group Centroids Matrix
Produced by Discriminant Analysis of Student Learning
Process Subgroups Within the Operations Research/
Computers Subject Group

VARIABLE	CENTROID Cluster 1	CENTROID Cluster 2	CENTROID Cluster 3
Cluster 1	100.0000	0.0000	0.7363
Cluster 2	0.0201	100.0000	0.4976
Cluster 3	0.0067	0.0000	100.0000

Table 11.4

Centours of Group Centroids Matrix
Produced by Discriminant Analysis of Student Learning
Process Subgroups Within the Organizational
Development Subject Group

VARIABLE	CENTROID Cluster 1	CENTROID Cluster 2	CENTROID Cluster 3	CENTROID Cluster 4
Cluster 1	100.0000	0.0020	0.0167	0.1454
Cluster 2	0.0003	100.0000	0.0688	0.9550
Cluster 3	0.5994	0.0002	100.0000	0.0000
Cluster 4	0.0054	0.1683	0.0000	100.0000

remains, "What happens if we move outside of the individual subject groups and look at the learning process unit without regard to the associated subject areas?".

The steps to be followed in answering this question are illustrated in Figure 11.7. The first step is to subject data from all thirteen subsets to discriminant analysis in order to establish the extent of overlap between student learning process subsets associated with different subject groupings. This analysis will focus on three separate data sets drawn from the student Course Evaluation questionnarie responses. The results obtained from these discriminant analyses will be used to establish a tentative set of revised or consolidated educational process groups. These tentative groups will be a refinement of the previous course type groupings since they are based on a more detailed representation of the total educational process occuring within each of the major subject areas. The separation between the new groups will then be tested using discriminant and classification analysis techniques. (See Figure 11.7 page 11-17).

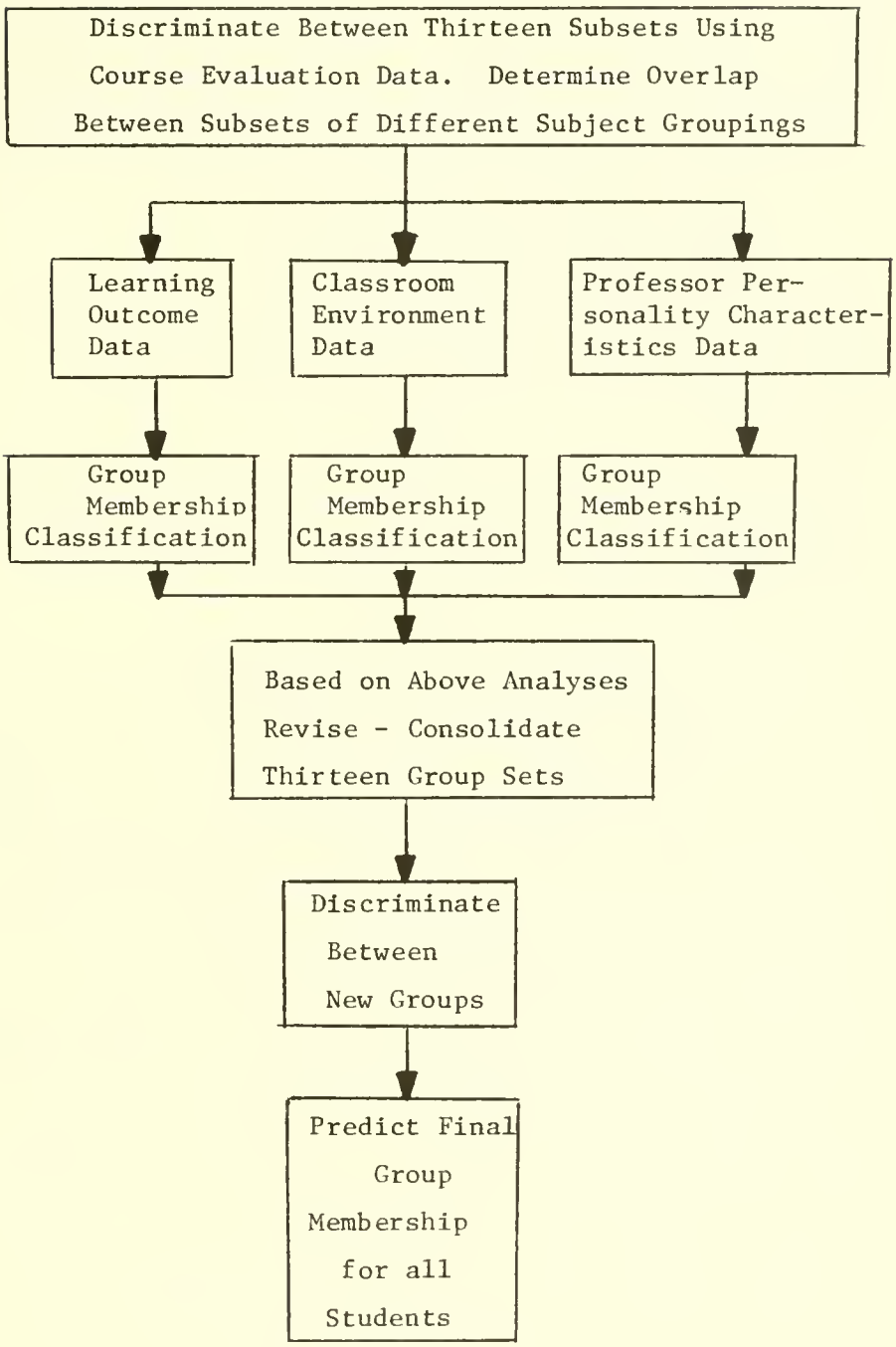
Discriminant Analysis of Thirteen Student Learning Processes Based on Learning Outcome Data

The current objective is to determine the degree of overlap between the thirteen subgroups based on learning outcome data. The goal of this analysis is to determine the extent to which the phenomenon illustrated earlier in Figure 11.2 is present in the currently established classifications, i.e., this test will isolate similarities such as the A2/B1 congruence hypothesized in Figure 11.2,

The discriminant analysis should reveal any significant overlaps between subgroups and suggest a final set of student educational processes. The

Figure 11.7

Summary of Analytic Sequence
for Discrimination Between 13 Subgroups


Discriminate Between Thirteen Subsets Using Course Evaluation Data. Determine Overlap Between Subsets of Different Subject Groupings
Learning Outcome Data
Classroom Environment Data
Professor Personality Characteristics Data
Group Membership Classification
Group Membership Classification
Group Membership Classification
Based on Above Analyses Revise - Consolidate Thirteen Group Sets
Discriminate Between New Groups
Predict Final Group Membership for all Students

relationship between sub groups will be further explored using the chi square group membership prediction techniques applied in earlier chapters.

The results of the discriminant analyses are summarized in the Centour of Group Centroids Matrix Table 11.5, page 11-19, and the Centour diagram plotted in Figure 11.8, page 11-20. In both displays subgroups associated with major subject areas are delineated in the following manner:

General Management = GM
Operations Research/Computers = OR
Mathematics = M
Organizational Development = OD

Individual clusters within subgroups are designated as M1, M2, M3, etc.

Both displays reveal significant overlaps between subgroups associated with different major subject areas. The following overlaps are particularly significant:

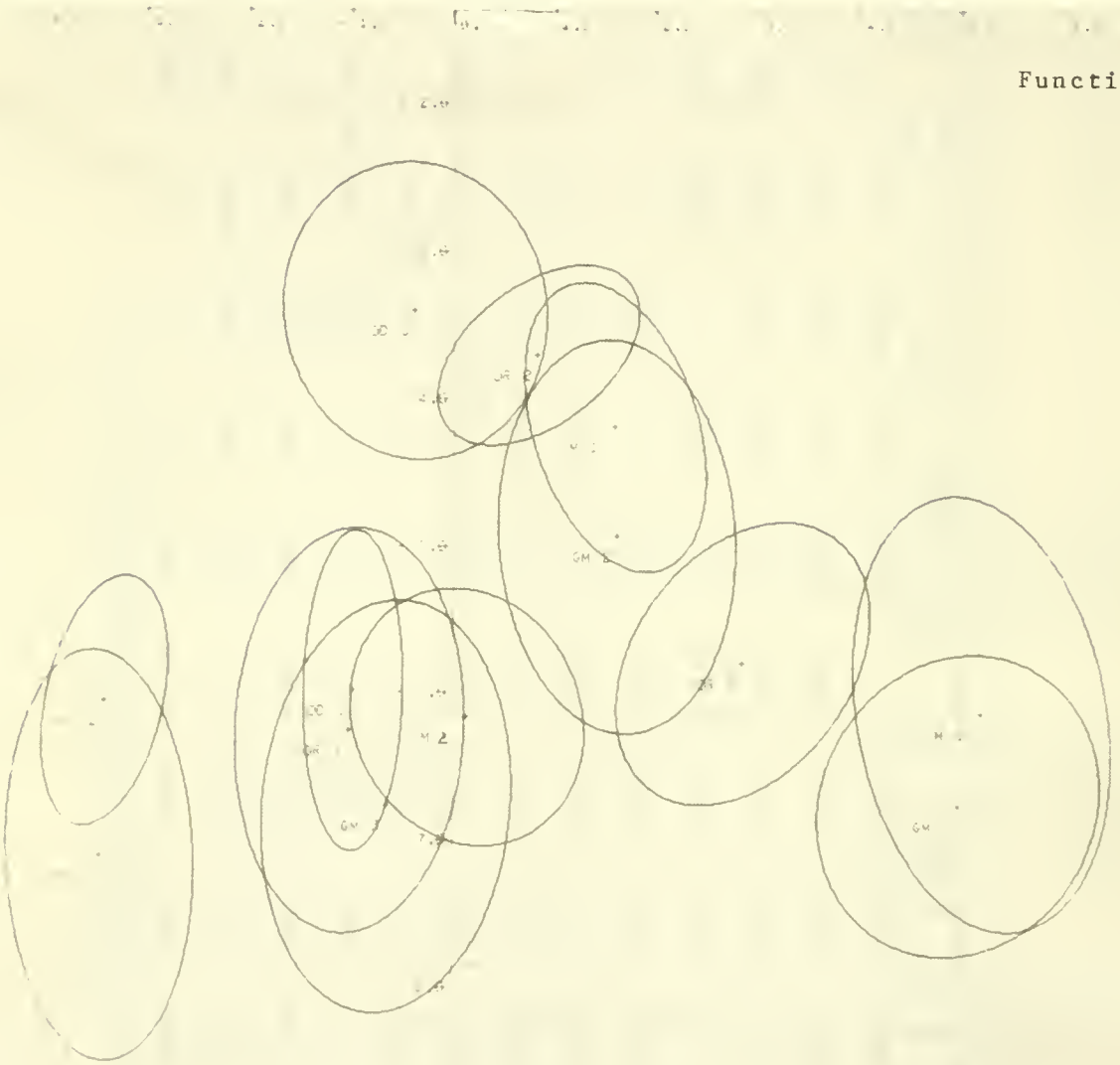
1) General Management 1 and Mathematics 3
2) General Management 2 and Operations Research/Computers 3 and Mathematics 1
3) General Management 3 and Operations Research/Computers 1 and Mathematics 2
4) Operations Research/Computers 1 and Mathematics 2
5) Operations Research/Computers 2 and Mathematics 1

The observant reader may note that the visible "field" derived from the Centour diagram is not totally consistent with the Euclidean distances indicated in the Centour of Group Centroids Matrix. This is because the discriminant anlaysis produced more than two significant functions and only functions 1 and function 2 are plotted in Figure 11.8. The apparent overlap between Organizational Development subgroups 2 and 4 in the plot of Functions 1 and 2 is not substantiated in the Centours of Group Centroids Matrix (.38 and .0018 overlap). Likewise, the relationship between Operations Research/Computers 2 and Organizational Development 3 appears to be one sided (47.50 and 2.69).

VARIABLE	CENTROID GRP. 1 GM 1	CENTROID GRP. 2 GM 2	CENTROID GRP. 3 GM 3	CENTROID GRP. 4 OR 1	CENTROID GRP. 5 OR 2	CENTROID GRP. 6 OR 3	CENTROID GRP. 7 M 1	CENTROID GRP. 8 M 2	CENTROID GRP. 9 M 3	CENTROID GRP. 10 OD 1	CENTROID GRP. 11 OD 2	CENTROID GRP. 12 OD 3	CENTROID GRP. 13 OD 4
GROUP NUMBER 1 GM 1	100.0000	0.3936	0.0001	0.0000	0.0	5.7516	0.0193	0.0000	52.9490	0.0	0.0	0.0000	0.0
GROUP NUMBER 2 GM 2	0.4244	100.0000	0.4021	0.0379	0.2519	25.3405	37.8541	0.6838	0.9685	0.0000	0.0	1.9263	0.0000
GROUP NUMBER 3 GM 3	0.0189	0.2838	100.0000	20.3621	0.0000	1.2533	0.0011	30.4396	0.0000	0.0000	0.0000	0.0004	0.0001
GROUP NUMBER 4 OR 1	0.0017	1.8002	33.0887	100.0000	0.0000	0.6672	0.0000	52.9924	0.0000	0.0000	0.0004	0.0001	0.0214
GROUP NUMBER 5 OR 2	0.0026	53.7259	0.1475	0.0036	100.0000	0.3026	38.5842	0.0091	0.0942	0.0000	0.0000	47.5018	0.0000
GROUP NUMBER 6 OR 3	14.3209	40.0580	0.0684	0.0009	0.0000	100.0000	13.3569	0.0262	7.4567	0.0	0.0	0.0411	0.0000
GROUP NUMBER 7 M 1	0.0930	60.9955	0.7652	0.0020	15.3397	2.4597	100.0000	0.0127	0.8576	0.0	0.0	5.6886	0.0000
GROUP NUMBER 8 M 2	0.0451	10.7966	19.9543	51.3107	0.0000	6.7793	0.0111	100.0000	0.0137	0.0000	0.0000	0.0003	0.0000
GROUP NUMBER 9 M 3	70.8719	0.6850	0.0000	0.0000	0.0	5.9565	0.0267	0.0000	100.0000	0.0	0.0	0.0000	0.0
GROUP NUMBER 10 OD 1	0.0002	0.1467	0.1408	0.0001	0.0589	0.0011	0.0000	0.1076	0.0000	100.0000	0.0000	0.0072	0.0264
GROUP NUMBER 1 1 OD 2	0.0000	0.0002	4.9279	0.0025	0.0001	0.0000	0.0000	0.0480	0.0000	0.0001	100.0000	0.0017	0.3786
GROUP NUMBER 1 2 OD 3	0.0000	9.3297	0.6521	0.0000	2.6874	0.0012	2.8947	0.0001	0.0004	0.0010	0.0000	100.0000	0.0000
GROUP NUMBER 1 3 OD 4	0.0000	0.0008	3.2311	1.6620	0.0000	0.0000	0.0	0.2571	0.0	0.0002	0.0018	0.0000	100.0000

Table 11. 5 Centours of Group Centroids Matrix for 13 Student Sub Groups Discriminated on Learning Outcome Responses

Figure 11.8 Centour Diagram based on 13 Subgroup Discriminant Analysis of Student Learning Outcome Perceptions Functions 1 and 2



Chi Square Classification of Students from the Thirteen Subgroups

Chi square classification of group membership will help clarify the nature of the overlapping relationships between the thirteen subgroups. Each student classifies into the subgroup to which it most resembles on a chi square measure of the distance from each subgroup. The chi square classification technique computes the distance between each student response and the means for each of the thirteen input groups. The student is assigned to the closest group.

Table 11.6 displays the original and predicted subgroup memberships derived from this analysis. Clearly the strongest (most stable) subgroups are General Management 1, General Management 3 and the four Organizational Development sub groups OD1, 2, 3, and 4. Each of these subgroups retains a majority of their original members. See Table 11.6 page 11-22.

Although General Management loses several members to other subgroups (particularly Mathematics 1 and 3), a majority of the students originally associated with this category are properly classified by the chi square procedure. This is not the case for Operations Research/Computers 1 and 2, Mathematics 1 or General Management 2. A majority of the students originally associated with each of these categories are classified into other groups by the chi square procedure. Operations Research/Computers 3 and Mathematics 2 and 3 maintain a majority of their original members despite major misclassifications, reflecting the overlap previously noted in the Centour diagram.

In final analysis, nine of the thirteen student learning process subgroups maintain a majority of their members after classification.

Table 11.6

X^2 Classification of 13 Student Subgroups

Predicted Group Membership	Original Groups												
	GM1	GM2	GM3	M1	M2	M3	OR1	OR2	OR3	OD1	OD2	OD3	OD4
GM1	37	1	0	0	0	10	0	0	1	0	0	0	0
GM2	0	17	0	12	0	0	0	5	2	0	0	2	0
GM3	0	1	26	3	4	0	3	0	0	0	2	0	1
M1	0	8	0	6	0	0	0	2	1	0	0	0	0
M2	0	3	0	0	10	0	5	0	1	0	0	0	0
M3	7	4	0	0	0	13	0	0	1	0	0	0	0
OR1	0	0	4	0	2	0	5	0	0	0	0	0	1
OR2	0	2	0	5	0	0	0	6	0	0	0	1	0
OR3	4	10	0	2	2	1	0	0	13	0	0	0	0
OD1	0	0	0	0	0	0	0	0	0	11	0	0	0
OD2	0	0	0	0	0	0	0	0	0	0	14	0	0
OD3	0	6	2	1	0	0	0	3	0	0	0	9	0
OD4	0	0	1	0	0	0	0	0	0	0	0	0	18

Discriminant Analysis Based on Classroom Environment and Professor Personality Responses

The analysis thus far has focused on a limited portion of the Course Evaluation data set. The thirteen student educational process subgroups were generated on the basis of learning outcome responses. It is now appropriate to ask whether students within these subgroups also exhibit different perceptions of the classroom environment and/or professor personality traits.

In order to answer this question, additional data from each of the thirteen subgroups will be evaluated using the discriminant analysis program. Figure 11.9 contains the Centour diagrams generated by an analysis of classroom environment perceptions while Figure 11.10 contains a similar display based on professor personality characteristic responses. (See pages 11-24,25).

Both analyses separate the four Organizational Development subgroups from those associated with all other major course areas, suggesting that the Organizational Development faculty is applying distinctly different teaching methods and styles. These figures stand in marked contrast to the Figure 11.8 Centour diagram based on the learning outcome perceptions. While it is possible to distinguish four or five different overlapping subsets in the learning outcome plot it is impossible to isolate more than two basic groups in either the classroom environment or professor personality characteristic diagrams.

Chi Square Classification Based on Classroom Environment and Professor Personality Characteristic Responses

The results of a chi square classification based on the classroom environment descriptions is summarized in Table 11.7. This display substantiates the confusion between groups implied by the extensive overlap

Figure 11.9 Centour Diagram for 13 Student Subgroups based on Discriminant Functions 1 and 2 from the Analysis of Classroom Environment Perceptions

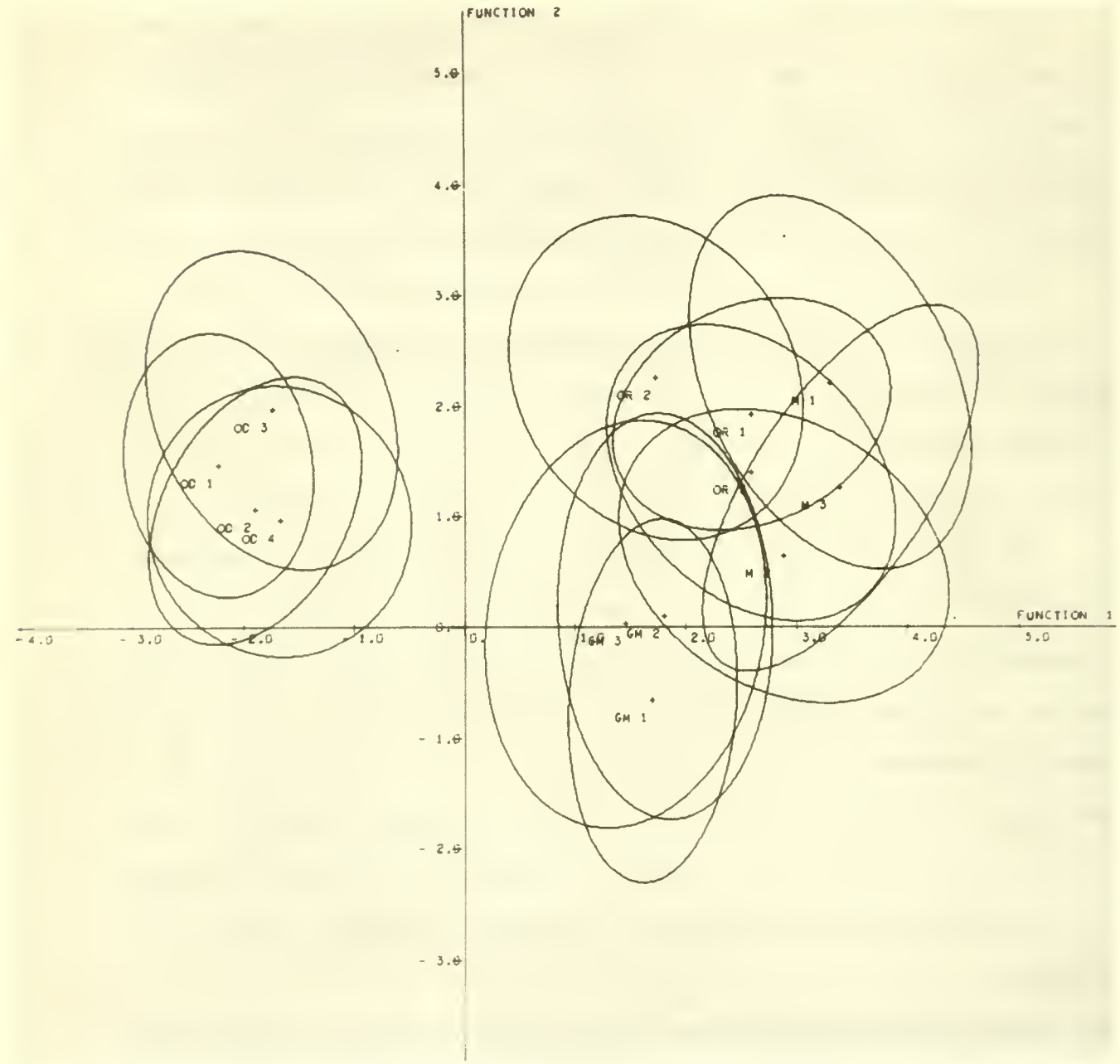
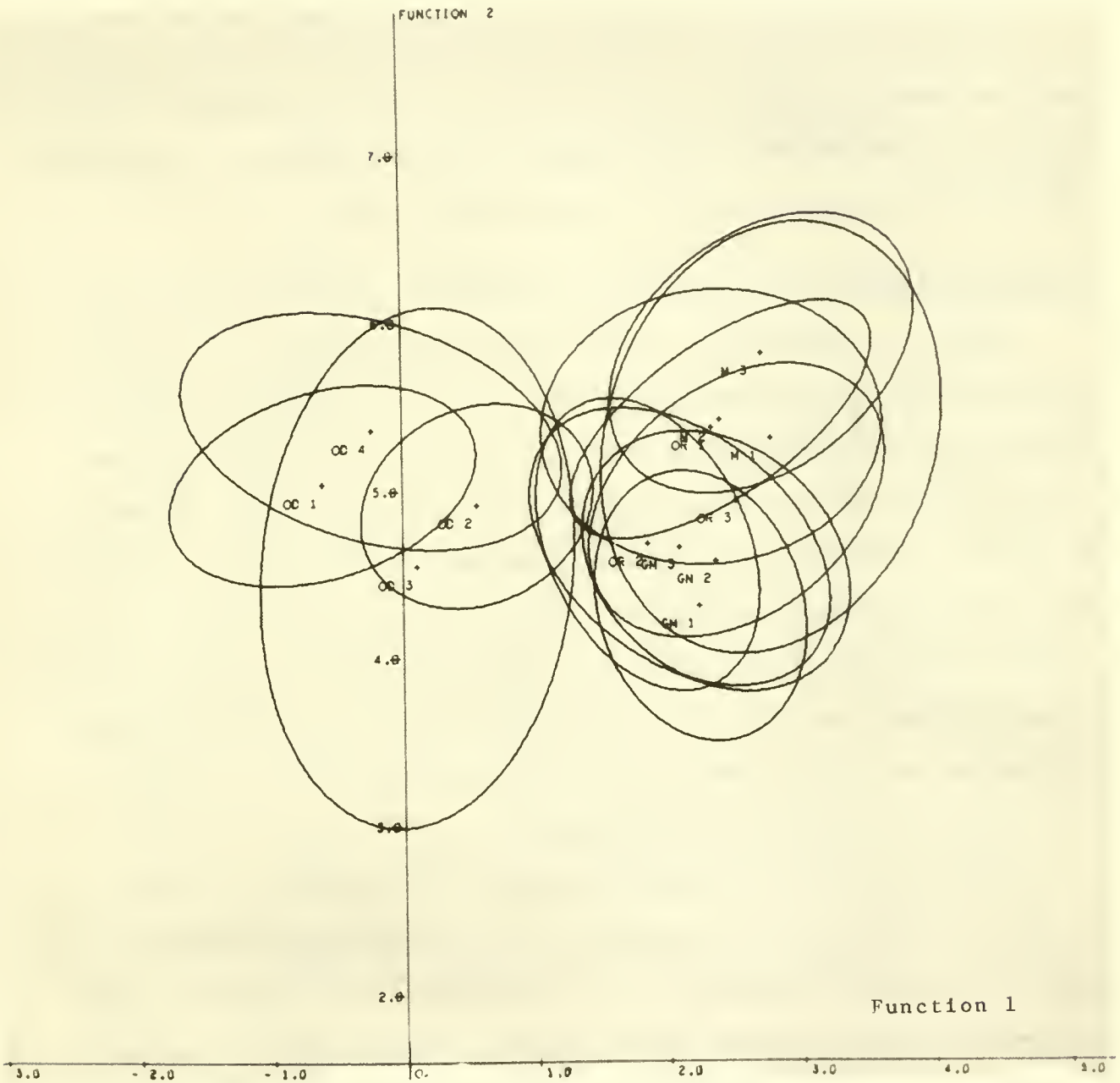


Figure 11.10 Centour Diagram for 13 Subgroup Discriminant Analysis of Student Perceptions of Faculty Personality Traits, Functions 1 and 2



present in the Centour diagram. Only five of the thirteen subgroups succeed in holding a majority of their original group membership. These marginally stable subgroups are: General Management 3, Operations Research/Computers 2, and Organizational Development 1, 2 and 4. See Table 11.7 page 11-27.

Even greater confusion is evident in the chi square classification analysis based on professor personality characteristics, Table 11.8 page 11-28. Mathematics 1 and Organizational Development 3 are the only two out of the thirteen subgroups maintaining a majority of their original membership.

Consolidation Based on Predicted Group Membership of Learning Outcome Data

Comparison of the results from the discriminant analyses and chi square classifications based on learning outcome, classroom environment and professor personality perceptions, clearly points out the superior sensitivity of the learning outcome factors when used to distinguish between student learning processes. In contrast, the classroom environment and professor personality factors tend to emphasize polarities in student perceptions of faculty teaching styles and personalities. Since the objective is to isolate learning process subgroups within the larger functional groups, the learning outcome discriminant analysis of subsets will be used as the primary basis for restructuring and combining overlapping groups.

Figure 11.8, which visually portrays the sub group overlaps on functions 1 and 2 resulting from the discriminant analysis of learning outcome data, will be used as the base point for the realignment of the thirteen subgroups into six new learning outcome groups. That is, members of the obvious overlapping groups in the plot will be combined into new groups. This visualization process is not entirely consistent with the results recorded in the Centours of Group Centroids Matrix, Table 11.5 which takes into account all four functions.

Table 11.7

X^2 Classification of 13 Student Subgroups Sets Using Classroom Environment Data

Predicted Group Membership	Original Groups												
	GM1	GM2	GM3	M1	M2	M3	OR1	OR2	OR3	OD1	OD2	OD3	OD4
GM1	14	7	2	0	0	1	0	1	0	0	0	0	0
GM2	10	15	4	2	1	2	0	0	1	0	0	0	0
GM3	15	11	17	0	1	0	0	0	3	0	0	0	0
M1	1	4	1	14	0	1	1	4	2	0	0	0	0
M2	2	4	2	2	9	5	4	0	1	0	0	0	1
M3	2	3	2	4	3	12	1	0	3	0	0	1	0
OR1	1	1	1	0	2	1	3	0	1	0	0	0	0
OR2	2	5	2	1	0	0	2	9	4	0	0	0	1
OR3	0	0	0	5	1	1	2	2	4	0	0	0	0
OD1	0	0	1	0	0	0	0	0	0	8	3	1	1
OD2	0	0	0	0	0	0	0	0	0	0	5	0	4
OD3	1	2	1	0	1	1	0	0	0	2	3	8	4
OD4	0	0	0	0	0	0	0	0	0	1	5	2	12

Table 11.8

X^2 Classification of 13 Cluster Student Subgroups

Using Professor Personality Characteristics Data

Original Group Membership	Original Groups												
	GM1	GM2	GM3	M1	M2	M3	OR1	OR2	OR3	OD1	OD2	OD3	OD4
GM1	7	9	3	1	1	0	0	3	1	0	0	0	0
GM2	10	11	5	5	0	1	0	1	2	1	0	0	0
GM3	5	3	6	0	1	1	0	2	1	0	0	0	1
M1	8	14	7	15	4	10	3	2	1	0	0	1	1
M2	0	0	0	0	0	1	0	0	0	0	0	0	0
M3	0	0	2	2	5	8	3	1	0	0	0	0	0
OR1	2	0	1	1	3	1	1	1	2	0	1	0	1
OR2	4	1	1	0	1	0	2	1	0	1	3	0	2
OR3	4	8	1	1	0	1	2	1	7	0	0	0	0
OD1	0	0	0	0	0	0	0	1	0	3	4	2	1
OD2	3	0	0	2	0	0	0	1	0	0	1	1	0
OD3	5	6	6	1	3	1	1	2	5	4	6	8	6
OD4	0	0	1	0	0	0	1	0	0	2	1	1	8

However, since functions 1 and 2 represent 90.3% of the total discriminant power, it is reasonable (and easier) to use the plot of these two functions to define the initial partition for the restructuring process.

This procedure of selecting new groups to be tested may be compared to the steps taken in cluster analysis, i.e., the selection of new groups (based on a rather substantial familiarity with previous analyses) parallels the definition of an initial partition in cluster analysis. The cluster analysis program accepts the initial partition (separation of groups) and then proceeds to test and improve upon it through a classification procedure. Likewise, following a discriminant analysis of the six newly defined learning outcome groups, individual members of each new group will be tested (through the X^2 classification procedure) and assigned to the group to which they demonstrate the closest proximity. This step will assure the correct realignment of students into distinct (discrete) learning outcome groups, and effectively eliminate any incorrect assignments resulting from the selection of the (new) group partitions. Overlaps on the plot of functions 1 and 2, Figure 11.8 suggest the following initial group combination scheme:

Group 1: Organizational Development 2 and 4 (OD2, OD4)

Group 2: General Management 3 (GM3), Operations Research/Computers 1 (OR1), Organizational Development 1 (OD1) and Mathematics 2 (M2)

Group 3: Organizational Development 3 (OD3) and Operations Research/ Computers 2 (OR2)

Group 4: Mathematics 1 (M1) and General Management 2 (GM2)

Group 5: Operations Research/Computers 3 (OR3)

Group 6: General Management 1 (GM1) and Mathematics 3 (M3)

Discriminant analysis of the new learning outcome groups produced remarkable separation with only a few noticeable overlaps between groups. Table 11.9, page 11-31, the Matrix of Centours of Group Centroids, which records the statistical distances between groups, indicates minor overlap between groups 3 and 4 (14.7, 6.8) and somewhat more substantial overlap between groups 4 and 5 (10.7, 27.5) and groups 5 and 6 (21.6, 6.5). Chi square classification was then performed, confirming the above overlaps. The number of students classified from their original group into another group is shown in Table 11.10 page 11-31. In order to improve upon the initial partition, all students who classified out of one group into another will be transferred into the new group. For instance, the three original members of Group 1 which classify into Group 2 in Table 11.10 will be reassigned to Group 2. Seventy three students were reclassified by this procedure. Forty of these student shifts represented an exodus from Group 4, the original Mathematics 1 and General Management 2 group. Note that all groups maintain a majority of their original membership. A second discriminant analysis (described below) was then performed on the reclassified student learning outcome groups. The resulting clean separation between the new groups could not be improved upon in further reclassification attempts, hence the reclassified groups will be called the final learning process groups. Although a number of the original faculty Pre Course groups have become blurred through combinations and reclassifications, it is interesting to note that Group 1 composed of two Organizational Development sub sets and Group 5 Operations Research/Computers maintain their specific subject purity, and that the majority of members in the General Management and Mathematics groups are consistently linked in three of the six revised groups.

Although the new learning process group structure lacks the conceptual simplicity of the subject based groupings, the former Pre Course structure was almost too simple. It is not reasonable to assume that all students in a

Table 11.9

Matrix of Centours of Group Centroids

For the Consolidated Learning Outcome Groups

VARIABLE	CENTROID Group 1	CENTROID Group 2	CENTROID Group 3	CENTROID Group 4	CENTROID Group 5	CENTROID Group 6
Group 1	100.0000	5.0217	0.0003	0.0002	0.0000	0.0000
Group 2	0.0839	100.0000	0.0033	3.0765	1.9843	0.0145
Group 3	0.0025	4.2227	100.0000	14.6602	0.0031	0.0008
Group 4	0.0000	6.4835	6.8171	100.0000	10.6701	0.6875
Group 5	0.0000	0.7240	0.0456	27.4731	100.0000	21.6288
Group 6	0.0000	0.0003	0.0000	0.2064	6.5343	100.0000

Consolidated Group Composition

Group 1: OD2, OD4
Group 2: OD1, M2, OR1, GM3
Group 3: OD3, OR2
Group 4: M1, GM2
Group 5: OR3
Group 6: M3, GM1

Table 11.10

X^2 Classification of Consolidated Learning Outcome Groups

Predicted Group Membership	Original Group Membership					
	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
Group 1	33	5	0	0	0	0
Group 2	3	64	0	7	1	0
Group 3	0	4	9	14	0	0
Group 4	0	0	3	56	3	0
Group 5	0	2	0	19	12	9
Group 6	0	0	0	0	3	63

particular type of course will respond in the same way to their classroom experience even though the stimuli presented in the course may be quite similar.

Validation of the Six Learning Process Groups

Final validation of the six group classification scheme was based on a discriminant analysis of the six groups using learning outcome data from the Course Evaluation questionnaire. The results of this analysis are summarized in the Centour of Group Centroids Matrix in Table 11.11 page 11-34 and the Centour diagram based on Functions 1 and 2 of the analysis presented in Figure 11.11 page 11-35.

The separation achieved by these six groupings is amazingly clean. The highest centour overlaps recorded between any two groups is 10.2 and 0.0 for Groups 5 and 6 respectively. The Centour diagram in Figure 11.11 provides a particularly convincing visual presentation of the discrimination achieved by this classification structure.

Process Descriptions

We have now demonstrated that students can be divided into six distinct groups based on their perceptions of the changes resulting from classroom experiences. The learning outcome factor analysis described in Chapter 5[1] condensed the various outcome measures into four factors -- interpersonal relations, managerial skills, knowledge of business, and personal insight. The differences among the six educational process groups may be described by examining group responses to these factors.

The variable contributions to discriminant function 1 are displayed in Table 11.12. (Function 1 is clearly the most dominant function, explaining

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[1]See Chapter 5, p. 5-77 to 5-80.

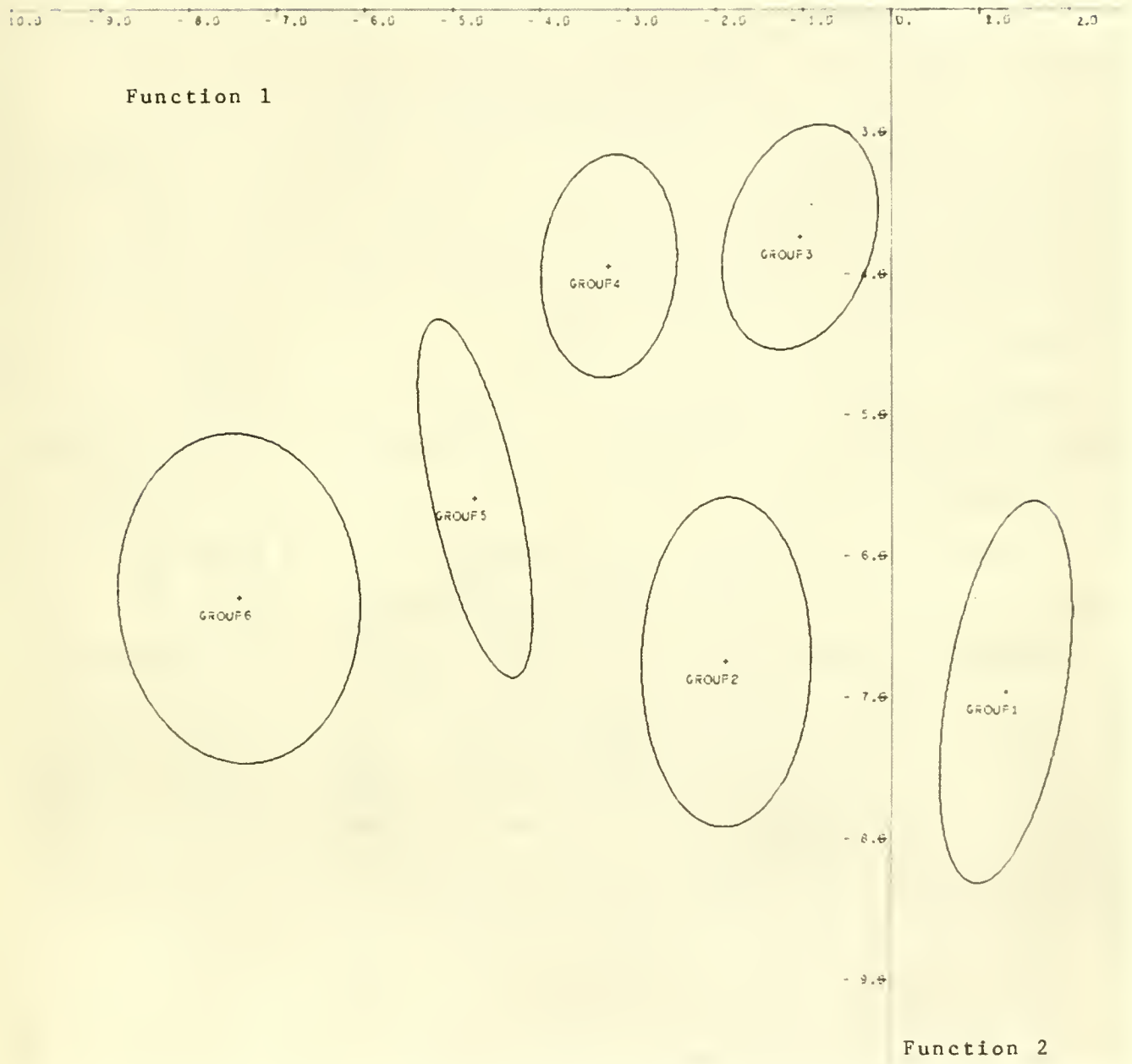
Table 11.11

Centours of Group Centroids Matrix

For Final Learning Process Group

VARIABLE	CENTROID Group 1	CENTROID Group 2	CENTROID Group 3	CENTROID Group 4	CENTROID Group 5	CENTROID Group 6
Group 1	100.0000	0.3554	0.0000	0.0000	0.0000	0.0000
Group 2	0.0008	100.0000	0.0090	0.0197	0.0003	0.0269
Group 3	0.0002	1.4590	100.0000	1.1540	0.0000	0.0001
Group 4	0.0000	1.4591	3.8010	100.0000	0.0043	0.0643
Group 5	0.0000	0.6347	0.0070	2.0777	100.0000	10.1569
Group 6	0.0000	0.0000	0.0000	0.0000	0.0000	100.0000

Figure 11.11 Centour Diagram Based on Functions 1 and 2 of the Discriminant Analysis of Final Learning Process Groups



87% of the variation among groups. The first three functions explain 100% of the variation encountered in this analysis.) See Table 11.12 page 11-37.

An examination of the variable weightings on function 1 indicates that the variable "managerial skills" is the single most significant basis for discrimination among the six groups. The variable contributions summarized in Table 11.13 confirm this observation. Values along the managerial skills dimension range from -7.9 to -1.9 exhibiting a large difference in variable contribution. In contrast, the interpersonal relations factor accounts for the least differentiation between groups with values on this dimension ranging from .09 to .21. (Because the managerial skills factor is negative, the lowest negative numbers will signify the highest experienced change.)

In order to facilitate evaluation, the variable contribution scores in Table 11.12 have been ranked from high to low score and the resulting rank order noted in the parenthesis above the values for each group on each factor.

The rank values substantiate the impressions obtained from the Centour diagram in Figure 11.11. Groups 1 and 6 are most divergent. Group 1, the pure Organizational Development group, scores the highest on the interpersonal relations, knowledge of business, and personal insights dimensions. However, they exhibit the lowest reported change on factor 2, managerial skills. At the opposite end of the spectrum, Group 6 (the General Management and Mathematics based sub group)[1], has the highest score on the managerial skills dimension and the lowest perceived change in knowledge of business and personal insight.

Group 2 occupies a mid ground appropriate to its composition drawn from

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[1]As noted earlier, the final group membership blurs to some extent the original composition of the six groups. However, all six groups retained a majority of their original group membership.

Table 11.12

Variable Contributions for Discriminant Function 1

VARIABLE	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
Interpersonal Relations	(1)* 0.2137	(2) 0.1633	(5) 0.1106	(6) 0.0905	(4) 0.1227	(3) 0.1403
Managerial Skills	(6) -1.9516	(3) -4.2048	(5) -2.2720	(4) -3.9470	(2) -5.7451	(1) -7.9241
Knowledge of Business	(1) 1.4308	(2) 1.0846	(3) 0.4549	(5) 0.2293	(4) 0.3583	(6) -0.0109
Personal Insights	(1) 1.5972	(2) 1.0639	(3) 0.6624	(5) 0.4011	(4) 0.5002	(6) 0.3398

*Numbers in parenthesis indicate rank order

General Management, Operations Research/Computers, Organizational Development and Mathematics. The contrast between Group 2 and 4 suggested by the Centour diagram is again substantiated by the variable contribution display. Group 2 scores consistently in the upper part of each dimension while the scores established by Group 4 members fall consistently below average.

Group 3's genesis in Organizational Development and Operations Research/ Computers might raise questions regarding the nature of the process in which its members are involved. This Group maintains a mid point in change relating to knowledge of business and personal insights and exhibits less change than other groups on the interpersonal relations and managerial skills dimension. Group 4 (Mathematics and General Management) exhibits the least perceived change in interpersonal relations and generally low values on the other three dimensions.

With the exception of the second place ranking on the managerial skill dimension, Group 5, representing students in Operations Research/Computers appears to be vying with Group 4 for low (little) change scores.

While recognizing the dominance of variable 2, managerial skills, it is interesting to note the parallel rankings of all groups on the knowledge of business and personal insight factors. This phenomenon is a result of multi-collinearity in the responses associated with these two factors. Although the factor analysis has been structured to produce orthogonal factors, the reduced sample size present in this analysis admits some correlation between variables. In the case of factors 3 and 4 the between variable correlation is -.62.

Final Validation Using Chi Square Classification

Application of the chi square prediction technique to the six groups produces the group membership matrix displayed in Table 11.13. All groups maintain a clear majority of their original membership when subjected to classification. Only

nine students out of 310 respondents failed to classify correctly in this analysis. It is difficult to imagine a more definitive validation of discriminative power.

Table 11.13 X^2 Prediction of Group Membership for Final Student Learning Process Groups

Predicted Group Memberships	Original Group Memberships					
	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
Group 1	39	0	1	0	0	0
Group 2	0	74	0	2	0	0
Group 3	0	0	36	4	0	0
Group 4	0	0	0	42	0	0
Group 5	0	1	0	0	41	0
Group 6	0	0	0	0	1	69

Chapter 12

Prediction of Change

"Most of the change we think we see in life
Is due to truths being in and out of favor."[1]

In the preceeding chapter students participating in various types of courses were classified into six learning process groups on the basis of their perception of the changes attributable to common course experiences. While it is managerially informative to have isolated these six sub groups it would be particularly useful to be able to predict the types of change that a particular student would experience when exposed to specific course experiences. Such a forecasting ability could enable us to achieve greater congruence among student and instructor expectations, provide students with a more realistic perception of their probable responses to the educational experience, and expose students to course content and methodology emphasizing the learning outcomes to which they are most sensitive. Assuming that different students learn in distinct ways, the ability to predict learning outcome perceptions will permit resources to be allocated to produce increased educational effectiveness.

The problem is to identify the bases for the observed differences in perceived change. What are the determinants? Do differences in demographics, educational or career objectives, self perceptions, or attitudes have a significant and measurable effect on the student learning experience? The key word is, of course, "measurable". It seems reasonable to assume that the factors mentioned probably do affect the student's participation

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[1] Robert Frost, "The Black Cottage".

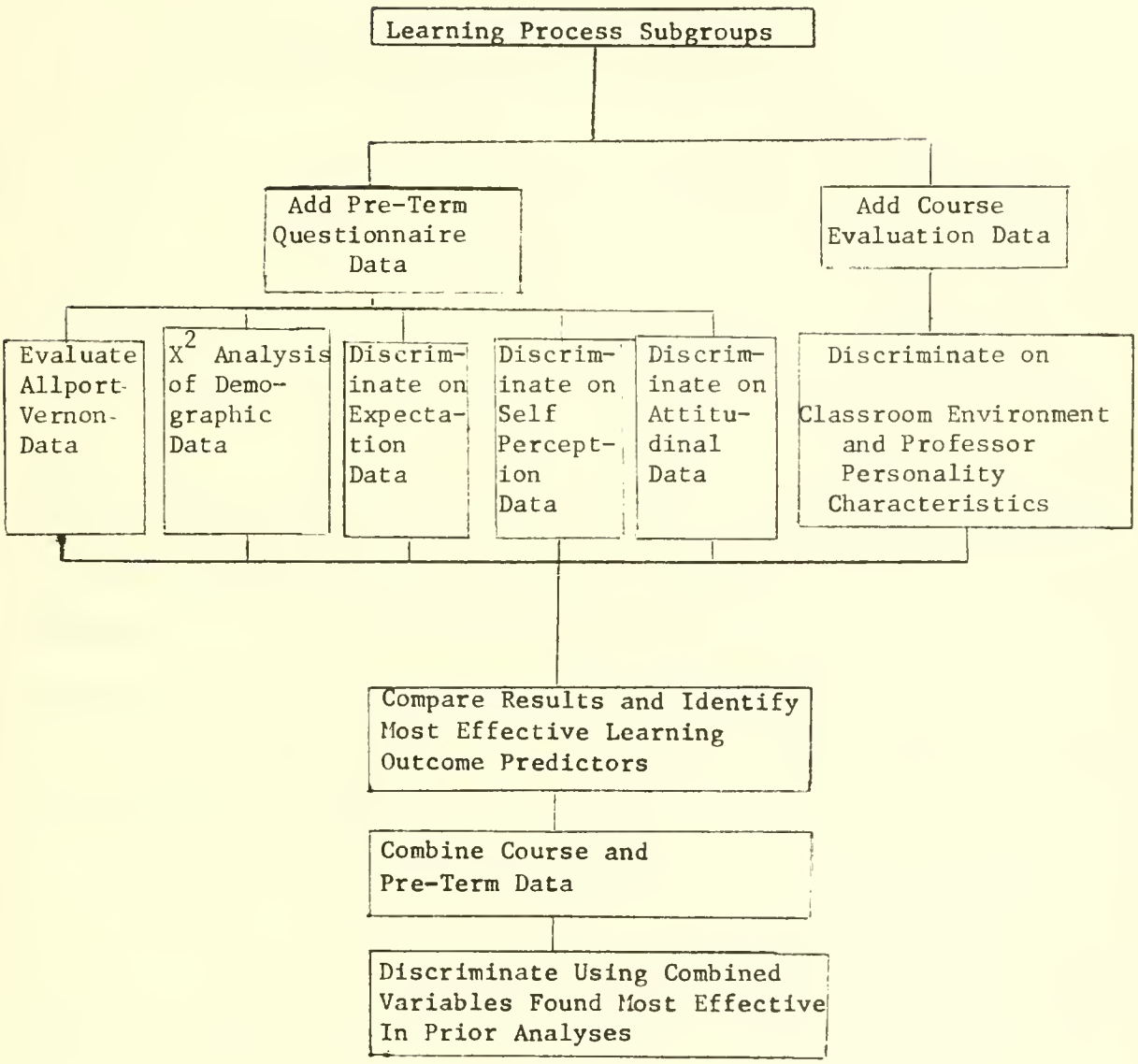
in the educational process, or, at least, his perceptions of that process. However, common sense not withstanding, there is a great difference between supposition and demonstrable fact. In the ideal case we would like to demonstrate that students entering with particular characteristics change in predictable ways when exposed to particular learning environments. The extent to which this ideal can be realized remains to be proven. However, it is clear that any progress in the direction of such a cause and effect linkage could have a substantial impact on the management of education.

This chapter is divided into four sections. The first two are devoted to an evaluation of data from the Pre Term and Course Evaluation questionnaires respectively. In each case the objective is to isolate dimensions offering some promise of predicting learning process group membership. In the third section of this chapter promising variables from the two data sources will be combined in an attempt to develop a procedure that can be used to predict learning outcomes. In the fourth section the success achieved using the resulting predictive formulation will be evaluated. The process followed in this analysis is summarized in Figure 12.1, page 12-3.

Methodology

Figure 12.1 illustrates the sequence of analyses performed against data from the course Evaluation and Pre Term questionnaires separately and in combination. It is useful to remember that the previous analysis which produced the learning outcome factors and subgroup classification was based on course evaluation data. Since each student is involved in several subjects during any one semester there is a strong possibility that a particular student may be represented in one or more of the learning process subgroups. That is to say, the same student may exhibit significantly different responses when exposed to varying stimuli in different courses. Investigation of the data sets produced in conjunction with

Figure 12.1 Prediction Process


Learning Process Subgroups
Add Pre-Term Questionnaire Data
Add Course Evaluation Data
Evaluate Allport-Vernon-Data
X^2 Analysis of Demo-graphic Data
Discrim-inate on Expecta-tion Data
Discrim-inate on Self Percept-ion Data
Discrim-inate on Attitu-dinal Data
Discriminate on Classroom Environment and Professor Personality Characteristics
Compare Results and Identify Most Effective Learning Outcome Predictors
Combine Course and Pre-Term Data
Discriminate Using Combined Variables Found Most Effective In Prior Analyses

the previous analysis produced the data summarized in Table 12.1

Table 12.1 Number of Students Appearing in Two or More Learning Process Subgroups

19 Students appear in 2 learning process groups

4 Students appear in 3 learning process groups

2 Students appear in 4 learning process groups

1 Student appears in 5 learning process groups

This significant degree of overlap would appear to reduce the probability of developing significant predictors based solely on data from the Pre Term questionnaire. Since the same student represented by a single Pre Term questionnaire experiences or perceives different learning outcomes under different classroom conditions, it would appear that course specific data or some combination of Pre Term factors and course predictors will be required to explain the different educational process outcomes.

Predictions Based on Pre Term Questionnaire Responses

This analysis is based on the now familiar four classes of pre term data: demographics, educational and career objectives, perception items, and attitudes toward business. A fifth data source, the Allport-Vernon-Lindzey Study of Values was also used.

Demographics

Demographics considered in this analysis include the complete personal background data set from Part I of the Pre Term questionnaire. Items from Part II of the questionnaire regarding undergraduate major, field of specialization in business, interest in pursuing a Ph.D., and a certainty in choice of field and in graduate school also entered this analysis. In addition, current and expected twenty year employment and salary expectations from section III were evaluated.

Differences among groups based on continuous variables were evaluated using F and t tests while the significance of differences among discrete category items was assessed by chi square analysis. No significant among group demographic differences were detected at either the .05 or .01 level. Demographics of the six groups are rather evenly distributed across all categories. Subsequently no predictive power can be gained from inclusion of the student demographics. The six learning process groups appear to be homogeneous across these dimensions.

Educational and Career Objectives

Four separate sets of questions form the basis for this portion of the analysis. These are: perceived strengths and weaknesses of the graduate school attended, educational activities expected to contribute to career objectives, the amount of change expected as a result of classroom interaction (learning outcome changes), and desired job characteristics. Question 21 of the Pre Term questionnaire was omitted from this analysis because of the extreme response stability established in prior analysis.

Responses to these four sets of Pre Term expectation questions from students in the six learning process groups were factor scored prior to input to discriminant analysis. The simultaneous use of all expectation data yields a greater number of variables thereby increasing the chance of generating significant discriminant functions.

The discriminant analysis results based on these data are not very encouraging to our hopes that Pre Term expectation data might be used to predict learning outcomes. The relative homogeneity of the groups is evident in both the Figure 12.2 Centour diagram and the Centours of Group Centroids Matrix, Table 12.2 (See Figure 12.2, page 12-7 and Table 12.2 page 12-8).

Four conditions emerging from the discriminant analysis deserve comment. The first three conditions involve group number three while the fourth relates to groups one and five .

Both the Centour diagram and Centours of Group Centroids Matrix emphasize the relative separation of group three from other groups. The most significant discrimination is between group three and group five (.18, 26.1) although group three is also somewhat separated from group six (17.1, 51.2).

Variable contributions scores for group three are slightly lower than those of other groups on six factors. Members of group three place less emphasis on size of school and social climate, academic specialization and independent study. They also expect less change in interpersonal relations and exhibit lower expectations with respect to the flexibility, challenge and freedom factor and the time available for personal life. In contrast to group three, group five records the highest expectation variable contributions on the academic specialization, independent study and time for personal life factor. Group six differs significantly from group three on the flexibility,

Figure 12.2 Centour Diagram Based on Discriminant Functions 1 and 2 for Educational and Career Expectations of Six Learning Process Groups

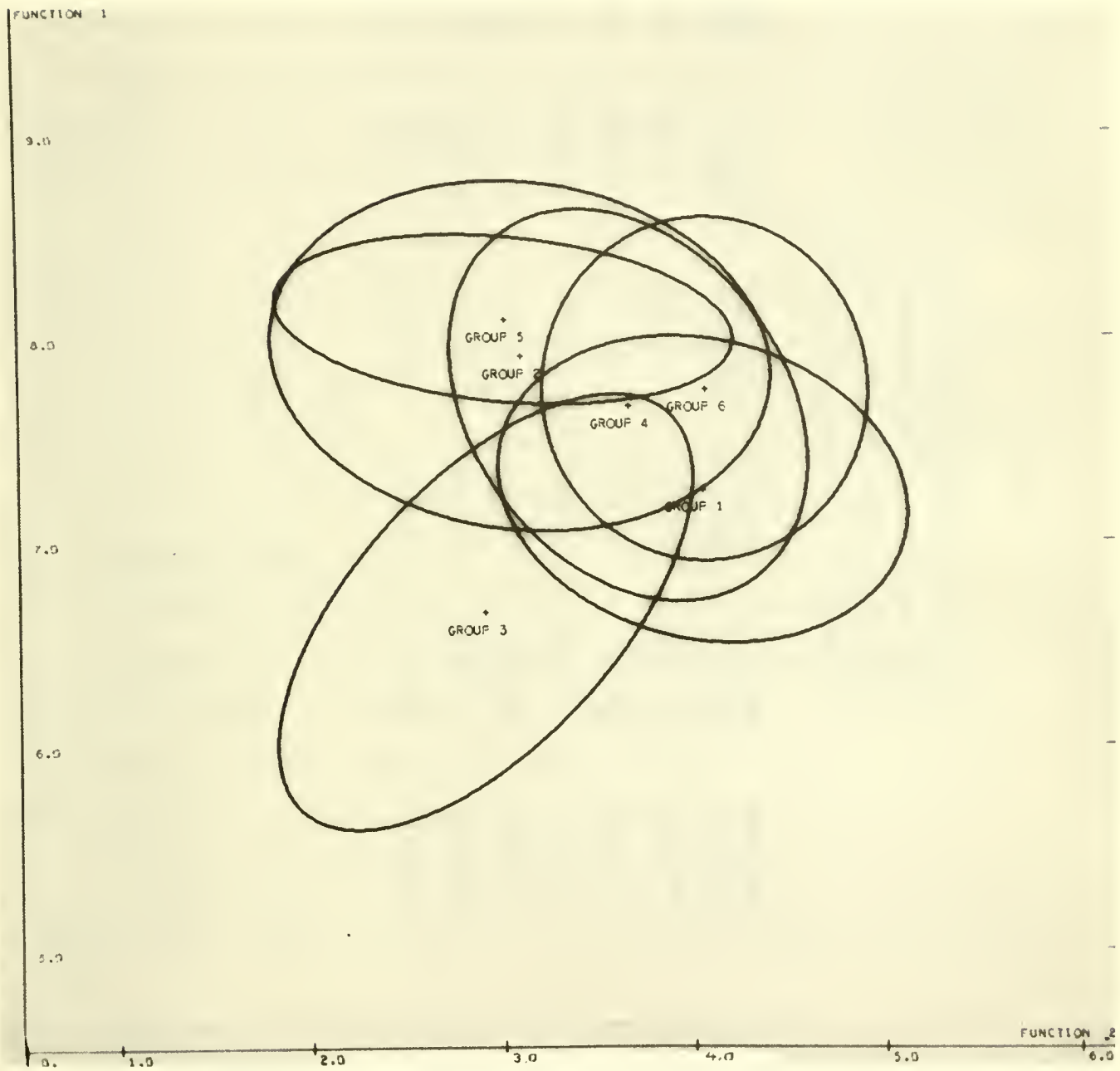


Table 12.2

Centours of Group Centroids Matrix
From Discriminant Analysis Based on
Educational and Career Expectations
of Students in 6 Learning Process Groups

Variable	Centroid Group 1	Centroid Group 2	Centroid Group 3	Centroid Group 4	Centroid Group 5	Centroid Group 6
Group 1	100.0000	60.5232	57.5540	87.1893	12.5139	84.3638
Group 2	51.0664	100.0000	39.1070	83.1033	91.0793	51.7545
Group 3	35.5755	33.0318	100.0000	29.5005	0.1794	17.1483
Group 4	82.7422	88.5346	63.2868	100.0000	57.0382	89.1388
Group 5	38.8684	97.7308	26.0877	76.1077	100.0000	43.1032
Group 6	80.3115	75.6887	51.2081	89.2048	55.6749	100.0000

challenge and freedom factor, on which it has the highest score of all groups.

While these distinctions may be indicative, they are not statistically significant. (The mere fact that the discriminant analysis program generated two discriminant functions does not necessarily indicate that those functions are significant.) The usual criterion of function significance is that the probability of random occurrence must be a maximum of five out of one hundred or .05. The discriminant function produced in the current analysis has significance of .1551 or sixteen out of one hundred. It therefore fails to meet the normally accepted standards of statistical significance and conclusions based on it must be viewed with appropriate skepticism.

Perception Data

Responses to questions 30, 31 and 32 of the Pre Term questionnaire are the source of student responses indicating perceptions of self, ideal self and a typical manager. In context of the current analysis our interest was in performing a discriminant analysis against the factor scored data generated by the members of the various learning process groups. Since the factor score procedure requires responses to all ninety semantic differential items, individuals who failed to check one or more variables had to be removed from

their respective group. Unfortunately, the length of the semantic differential questionnaire (90 separate items) gave student respondents the impression that they could "skip over" one or two items with impunity. Removal of all students who failed to respond to each of the semantic differential items all but eliminated the majority of the original learning process groups.

The initial group sample sizes: 39, 75, 37, 42, 42, and 69 respondents were drastically reduced to 8, 8, 6, 3, 8, and 8 respectively. Group four which contained only three respondents after the elimination procedure was completed, was ultimately dropped from the analysis because of the discriminant analysis requirement that the number of respondents in each group must be at least as large as the number of groups.[1]

Because of the extremely small sample sizes it is difficult to attribute much generality to the results of the discriminant analysis summarized in the Centour diagram and Centour of Group Centroids Matrix presented in Figure 12.3 and Table 12.3 respectively. (See Figure 12.3 page 12-11 and Table 12.3 page 12-12.)

The plot of functions 1 and 2 (Figure 12.3) shows that groups 2 and 5 are the most clearly separated from the others and that groups 1, 3 and 6 overlap to a large degree. The Centroid Matrix (Table 12.3) confirms the observation. Four factors are responsible for the highest

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[1] In view of the dramatic impact of this reduction one would wonder why we did not set the non-respondent items to a neutral value at the mid point of the semantic differential scale (4). Although such a procedure would insure adequate sample sizes for all six groups, the resulting analysis would suffer in two ways. First, by substituting, we effectively interpret a neutral value of four for a non-response item - or respond in behalf of the student. Lack of response may signify unwillingness to commit to a certain positive or negative value on paper. Secondly, inclusion of a large number of neutral values would reduce correlations between variables and the ability to discriminate effectively between groups.

Figure 12.3 Centour Diagram Based on Discriminant Functions 1 and 2 for Perceptions of Five Learning Process Groups

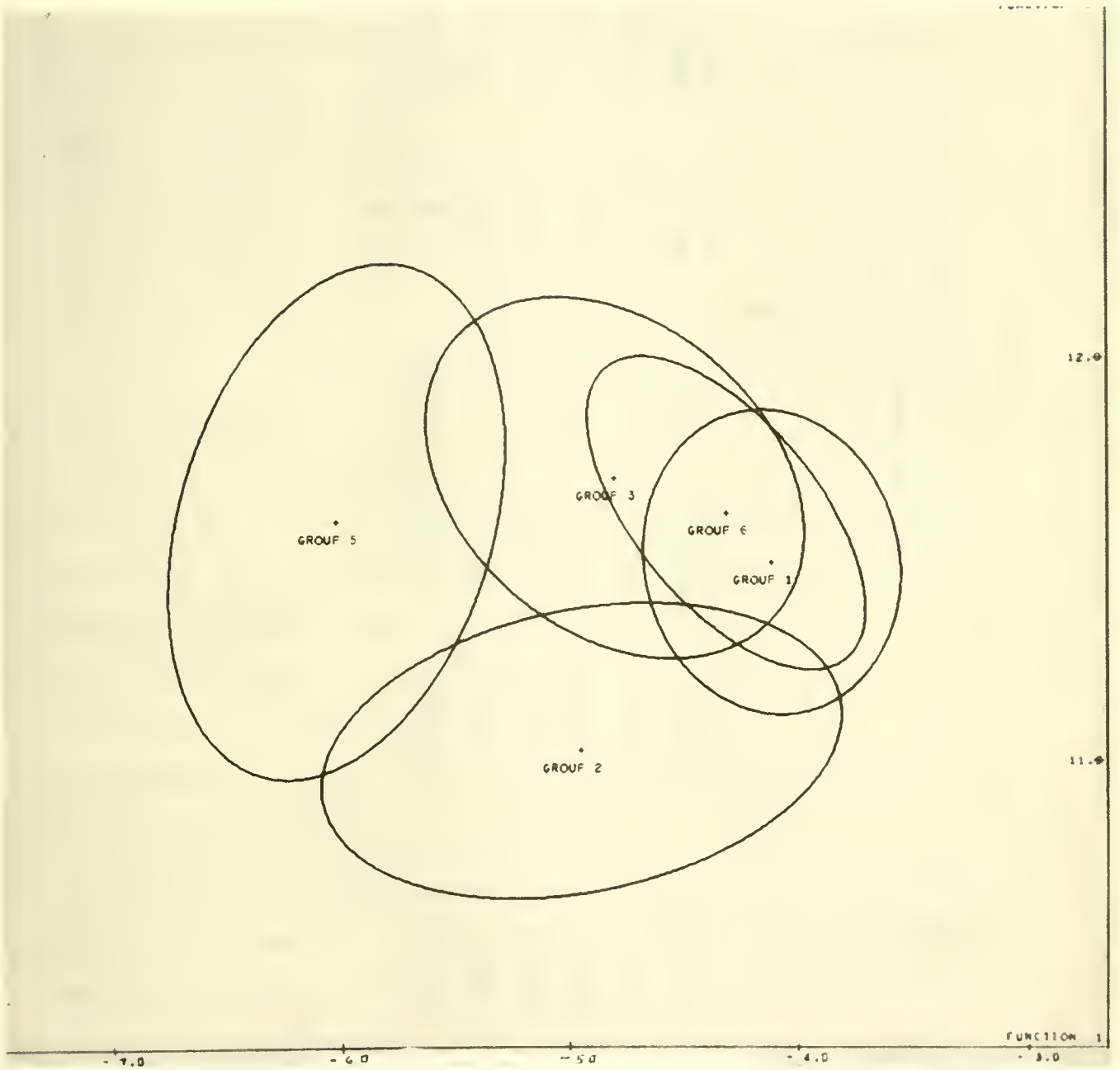


Table 12.3

Centours of Groups Centroids Matrix
From Discriminant Analysis Based on
Perceptions of 5 Learning Process
Groups

Variable	Centroid Group 1	Centroid Group 2	Centroid Group 3	Centroid Group 5	Centroid Group 6
Group 1	100.0000	40.4644	69.2182	2.3102	93.8796
Group 2	13.3664	100.0000	25.6995	13.7354	1.4191
Group 3	42.8500	17.0483	100.0000	24.3934	68.4823
Group 5	0.3270	11.6514	26.0582	100.0000	0.1577
Group 6	89.9960	27.0368	84.0675	5.5757	100.0000

weightings present for function 1. The first two relate to characteristics of the typical manager while the third and fourth refer to factors describing ideal self perception and a combination of ideal and real self perceptions. The typical manager characteristics are Cold/Confident Leadership and Sensitivity/Sincerity. The ideal self description factor is Persuasive/ Mature Leadership. The factor combining ideal and real self items is called Cynicism in the Real and Ideal Self. In examining the variables (factor) titles used in the preceding description it is important to remember that the factors are derived from numerous semantic differential variables and the titles assigned are composites of high loading variables making up the factor.

The factor which we have called Cold Confident Leadership as an attribute of the typical manager provides the strongest basis for discrimination encountered in this analysis. The members of group five place greater emphasis upon this variable than do members of any other group. Both groups two and five have higher scores on the ideal self factor, Persuasive/Mature Leadership and the Cynicism in the Real and Ideal Self factor. These same groups exhibit lower scores on the factor derived from perceptions of the typical manager, Sensitivity and Sincerity.

The general impression emerging from this analysis is that members of groups two and five have a more positive, leadership oriented perception of the typical manager as well as a positive leadership perception reflected in their ideal self perceptions. These individuals are also distinguished from their compatriots in other groups by higher self and ideal perceptions and lower cynicism.

Although the predictive power of the semantic differential self perception items is clearly far from perfect, the results are more encouraging

than those obtained from analysis of demographic and expectation data.

Attitudes Toward Business

The ninety four item Personal Opinion Questionnaire used to establish student attitudes toward business was plagued by the same selective item non response problem encountered with the perception data. Student hand-written comments from this section of the questionnaire suggest that the length combined with a focus on business issues upon which students frequently felt unqualified to comment, increased the likelihood of non response. It may also be significant that the Personal Opinion Questionnaire was the last section of the booklet and followed the ninety semantic differential items.

Elimination of data for all students who did not respond to the full ninety four items set removes two of the six learning process groups and reduces the samples in the remaining four groups to a non representative level. At the conclusion of this procedure we were left with groups two, three, five and six having four, four, eight and five respondents respectively. Thus expansion of any conclusions based on these data to the larger group will be tenuous at best.

The first discriminant function generated by the analysis of data from the four learning process groups explains 68% of the variation and has high weightings on two opinion factors, "A large corporation is preferable to a small corporation" and "The average worker in industry prefers to avoid responsibility."

The Centours of Group Centroids Matrix developed from this analysis and presented in Table 12.5 shows that groups five and six have the least overlap with other groups. Insert Table 12.5, page 12-15. Respondents in groups five and six favor large corporations and have greater confidence in worker responsibility and independence than do members of groups two and three. Group 5

Table 12.5

Centours of Group Centroids Matrix
From Discriminant Analysis Based on
the Attitudes Toward Business of Students
in 4 Learning Process Groups

Variable	Centroid Group 2	Centroid Group 3	Centroid Group 5	Centroid Group 6
Group 2	100.0000	58.1659	54.7284	8.4972
Group 3	47.3980	100.0000	15.0952	35.5679
Group 5	0.0693	0.0008	100.0000	1.5374
Group 6	0.0000	0.0027	0.1551	100.0000

and group 6 exhibit opposite responses on the Authoritarian Structure factor, composed of items such as "A clearcut hierarchy of authority and responsibility is the cornerstone of the business organization." Groups 5 and 6 also differ strongly on the Separation of Private and Corporate life factor ("The private life of an employee should be of no direct concern of his company."). Group 5 scores highest in favor of separation of job and personal life, group six the lowes

As might be expected, groups five and six pass the chi square prediction of group membership test while groups two and three do not. The analysis is summarized in Table 12.6. (See Table 12.6, page 12-17.)

It therefore appears that members of the two learning process groups reporting the greatest change along the managerial skills acquisition dimension prefer larger corporations and have greater faith in the "average worker" than their compatriots in the other educational process groups while they differ on issues of authority structures and the separation of job and personal life. Although there is a strong temptation to build further on these data the paucity of full response sets requires that the personal opinion items be excluded from the remaining analysis. The data will, of course, enter our later qualitative assessment of the educational process.

Allport-Vernon-Lindzey Study of Values

Responses from the Allport-Vernon-Lindzey instrument administered at the Sloan School were analyzed to determine whether they might help to explain the composition of the six learning process groups. The discriminant analysis failed to produce a single significant function. The Centours of Group Centroids Matrix produced by this analysis (Table 12.7) exhibits some of the highest among group overlaps encountered in this research. (See Table 12.7, page 12-18.)

The predictive value of the Allport-Vernon-Lindzey scores in this context is nil.

Table 12.6

X^2 Prediction of Group Membership for 4
Learning Outcome Groups on Personal Opinion Data

Original Groups	Predicted Membership Group 2	Group 3	Group 5	Group 6
Group 2	0	1	1	0
Group 3	2	2	1	1
Group 5	2	0	5	0
Group 6	0	1	1	4

Table 12.7

Centours of Group Centroids Matrix
From Discriminant Analysis Based on
Allport Vernon Lindzey Data for 6 Learning
Process Groups

Variable	Centroid Group 1	Centroid Group 2	Centroid Group 3	Centroid Group 4	Centroid Group 5	Centroid Group 6
Group 1	100.0000	88.3753	89.1388	99.2982	95.6582	92.9903
Group 2	88.8833	100.0000	45.3990	85.8841	92.5691	87.8506
Group 3	95.7397	72.4712	100.0000	89.5320	81.3744	84.8339
Group 4	98.0702	91.6682	83.0109	100.0000	95.2220	92.0864
Group 5	96.3292	94.5024	70.7566	95.0859	100.0000	95.8107
Group 6	50.1687	69.8142	54.6944	70.7736	79.5788	100.0000

The Predictive Value of Pre Term Data

This evaluation of data from the Pre Term questionnaire indicates the homogeneity of the six learning process groups with respect to demographics, educational and career objectives, and personal values as measured by the Allport-Vernon-Lindzey instrument.

The most likely learning outcome predictors appear to be the perceptions of self, ideal self and typical manager and attitudes toward business. Although the sample sizes on which these conclusions are based were limited by factor scoring constraints, the semantic differential perception items will be carried into later analyses as the most likely learning outcome predictor based on the Pre Term questionnaire responses.

The Predictive Value of Course Evaluation Data

We turn now to the second data source to be evaluated as a potential contributor to learning process group membership prediction. The data source is the Course Evaluation questionnaire and, for purposes of this analysis, the responses attained from this instrument will be divided into two variable subsets. The first involves the classroom environment variables from the second portion of the Course Evaluation questionnaire. These are structured in terms of the six factors defined in Chapter 5. The second data set encompasses the seven factors derived from the student descriptions of faculty personality characteristics also described in Chapter 5. (Remember that the six groups were defined by Course Evaluation learning outcome data.)

Data from the Course Evaluation questionnaires submitted by members of the six learning process groups were factor scored and the thirteen resulting factors became the input to the discriminant analysis on which this evaluation is based.

The two significant functions generated by this analysis explain a total of 89% of the variation. However, function one which accounts for 63% of the variation is clearly dominant. The relative separation achieved by these two functions is summarized in the Centours of Group Centroids Matrix (Table 12.8 and the Centour diagram of functions 1 and 2 presented in Figure 12.4. (See Table 12.8, page 12-21 and Figure 12.4, page 12-22.)

Function one clearly separates group one from the other five sub sets, particularly groups four, five and six. Function two isolates group three and produces a particularly clear separation between groups three and six.

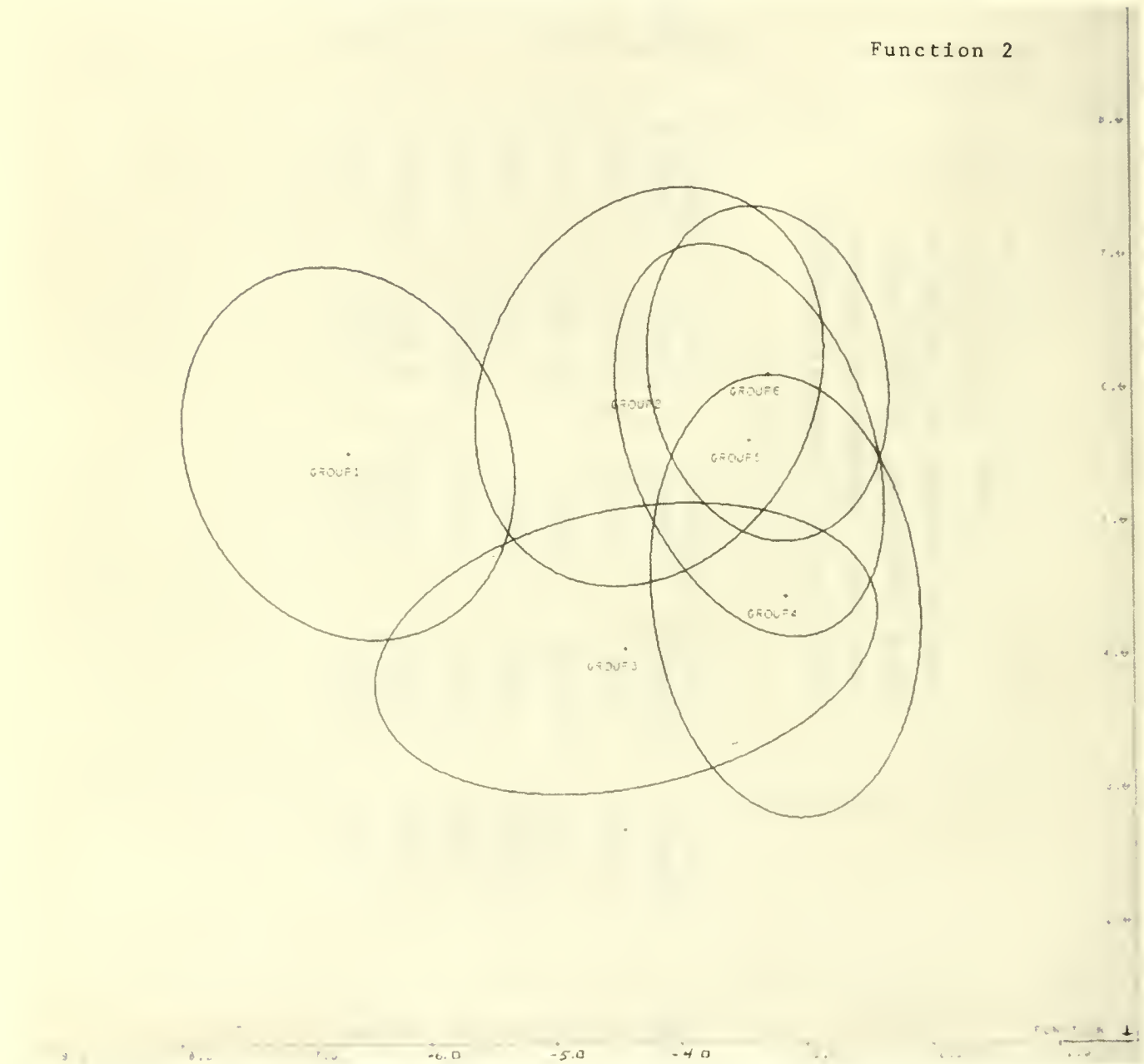
An evaluation of variable weightings associated with the discriminant functions reveals that four factors are largely responsible for the separation achieved by this analysis. Three of the four factors are based on classroom environment data: the professor's level of activity and ability to motivate, extent of feedback, and course organization. The single significant factor emerging from the student perceptions of professor personality traits is the Leadership factor incorporating "Follows/Leads, Easily influence/Mind of own, Lacks confidence/Confident" etc.

Table 12.8

Centours of Group Centroids Matrix
From Discriminant Analysis Based on
Classroom Environment and Professor
Personality Perceptions of 6 Learning
Process Groups

Variable	Centroid Group 1	Centroid Group 2	Centroid Group 3	Centroid Group 4	Centroid Group 5	Centroid Group 6
Group 1	100.0000	22.5465	13.1638	0.5049	0.6018	0.1552
Group 2	15.9798	100.0000	18.5800	42.5321	75.7807	60.5304
Group 3	18.1594	41.9890	100.0000	46.2133	22.4845	9.6928
Group 4	3.0085	35.0715	80.0347	100.0000	73.0779	41.5538
Group 5	5.0166	78.7500	35.7966	76.8065	100.0000	90.4888
Group 6	3.0197	79.2427	16.9197	60.5018	91.1116	100.0000

Figure 12.4 Centour Diagram Based on Discriminant Functions 1 and 2 for Classroom Environment and Professor Personality Perceptions of Six Learning Process Groups



The variable contributions table for function one helps us to understand the difference in group one's perception of the classroom environment. Professors are perceived as providing greater motivation and more feedback. The course process is perceived as relatively unstructured with the professor assuming less of a leadership role than in the other five learning process situations. These observations appear quite consistent with the Organization Development courses associated with this learning process group. 'O.D.' courses at the Sloan School are based on relatively small unstructured classes, detailed feedback to the students and a non-directive teaching role.

Variable contributions for function two which differentiates group three from group six indicate that the separation is largely attributable to group six's emphasis on faculty motivation, course structure and the professor's leadership role.

Application of the chi square group membership prediction technique to the Course Evaluation data yields the results illustrated in Table 12.9. Only groups one and three meet the significance test by maintaining a majority of their pre-classification membership. A plurality of groups two and four are correctly classified, however, the majority are incorrectly assigned to other learning process groups. Groups five and six completely fail the classification test with the largest number of members from each of these groups being incorrectly identified as group two members. (See Table 12.9, page 12-24.)

We thus emerge with some indication that membership in group one or three may be predicted based on the course evaluation data relating to classroom environment and student perception of professor personality traits. However, these data do not contribute markedly to our understanding of the basis for membership in the other four groups.

Table 12.9

X^2 Prediction of Group Membership for 6
Learning Process Groups Based on Classroom
Envrionment and Professor Personality Perception Data

Original Groups	Predicted Group Membership					
	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
Group 1	27	11	3	1	1	1
Group 2	5	31	2	4	13	28
Group 3	6	9	22	9	6	5
Group 4	1	7	8	22	10	13
Group 5	0	4	1	5	6	10
Group 6	0	13	1	7	6	12

Combined Pre Term and Course Evaluation Based Predictions

The analysis thus far has identified two data sets from the Pre Term questionnaire and two from the Course Evaluation form which appear to predict membership in one or more of the six learning process groups. The next step is obviously to combine data from the two questionnaires in the hope that the sum of the data elements will provide a more effective prediction than the individual item data considered separately.

As noted earlier factor scoring the Personal Opinion items produced such a severe reduction in sample size that it is unreasonable to extend the analysis of these data. Although the semantic differential questions also produced marginal sample sizes, relatively even distributions are maintained across the six groups. The semantic differential perception data will therefore be combined with the classroom environment and professor personality factors from the Course Evaluation questionnaire. The learning process group samples used in the Course Evaluation data analysis were pre filtered to insure that valid perception data were available for each student included in the analysis, i.e., the Course Evaluation sample was limited to students for whom valid Pre Term perception data were available.

The results of the discriminant analysis based on these combined data sets are summarized in the Centour of Group Centroids Matrix (Table 12.10) and the Centour diagram based on functions one and two illustrated in Figure 12.5. Both these references indicate that the combination of variables produces the sought after prediction. The greatest degree of overlap noted in the Centours of Group Centroids Matrix is 7.77 and the Centour diagram provides striking visual verification of the complete separation achieved between the six groups. (See Table 12.10, page 26 and Figure 12.5, page 27.)

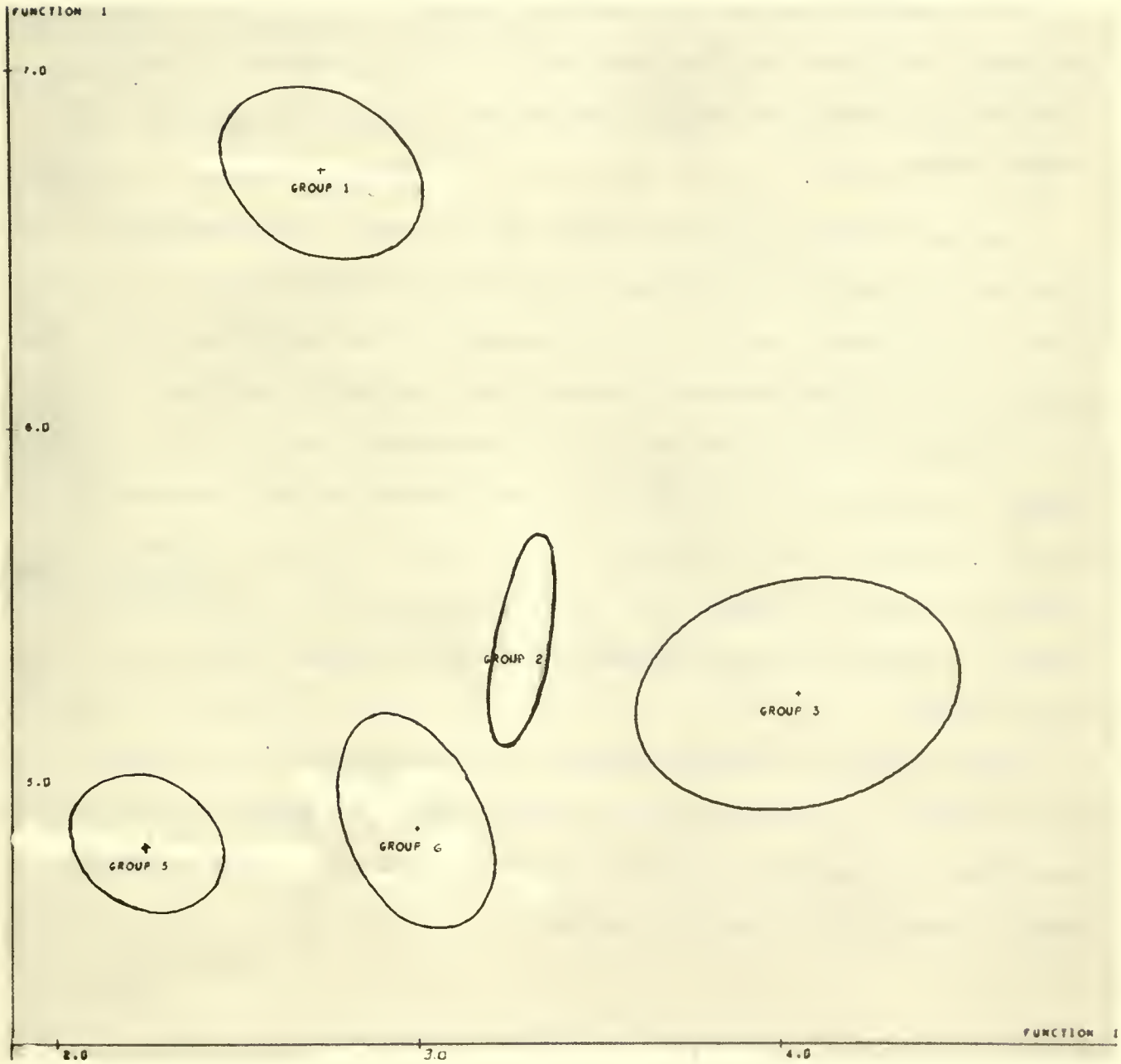
A quick glance at the Centour diagram should convince the most skeptical reader that function one successfully separates group one from the remaining

Table 12.10

Centours of Group Centroids Matrix
From Discriminant Analysis Based on
Combined Pre-Term and Course Evaluation
Data from 5 Learning Process Groups

Variable	Centroid Group 1	Centroid Group 2	Centroid Group 3	Centroid Group 5	Centroid Group 6
Group 1	100.0000	0.0000	0.0000	0.0000	0.0000
Group 2	0.0000	100.0000	7.7686	0.0000	0.0000
Group 3	0.0000	0.0000	100.0000	0.0000	0.0000
Group 5	0.0000	0.0000	0.0179	100.0000	0.0002
Group 6	0.0000	0.0000	0.1252	0.0000	100.0000

Figure 12.5 Centour Diagram Based on Discriminant Functions 1 and 2 for Combined Pre Term and Course Evaluation Data from Five Learning Process Groups



learning process subsets.

Seven variables have predominant weightings on Discriminant Function 1 which clearly separates Group 1 from the rest of the Groups. The Variable Contributions table for Function 1 reveals several unique Group 1 characteristics. Students responding in this learning outcome group perceived less leadership emphasis and greater creativity (uninhibited, original, personal) in their faculty members. They also described a typical manager as less sensitive and sincere and somewhat less satisfied and tactful than did other groups.

Function 2 (which accounts for 36% of the variation) can be used most effectively to describe the differences between Group 5 and Group 3. Group 5 is the highest scoring group on Function 2 on six variables: perceptions of stronger leadership characteristics in faculty members; high emphasis on the leadership role of a typical manager; and student self perceptions as more cynical, more uninhibited, more realistic and more competitive than other groups. Both Group 1 and Group 5 scored higher than Group 3 in emphasis upon the motivational power of the faculty member, and concern for course applicability, but placed less emphasis on course content.

Because Function 3 explains only 11% of the variation, the differences in the Variable Contributions are much less noticeable. However this function does reveal that students in Group 6 perceive their faculty members as being harder and more cynical than other groups.

Application of the chi square prediction procedure to these data yields the classification summarized in Table 12.11. The power of the discriminant functions developed from this analysis is clearly demonstrated by the quality of group membership prediction. Four out of the five groups are perfectly reconstituted by the analysis. Only group two in which two members were misclassified fails to achieve perfect reproduction. (See Table 12.11, page 12-30.)

On the basis of this analysis it would appear that the combined Course Evaluation and student perception data can be used to predict learning process group membership. However, these results can only be considered indicative. The greatly reduced sample size makes generalizations to the larger learning process group population difficult at best. It is natural to be suspicious of those students who provided full responses to all the data sets required for these analyses. At the very least, we would expect them to rank in the top most percentile in compulsiveness!

Final Validation

It is obvious that the previously noted factor scoring procedures (rejecting zero responses) preclude our extending this analysis to the total sample. However there is another way to evaluate the extent to which the reduced groups are representative of the original sample.

Table 12.11

X^2 Prediction of Group Membership for 5 Learning Outcome Groups Using a Combination of Pre Term and Course Evaluation Variables

	Predicted Group Memberships				
Original Group	Group 1	Group 2	Group 3	Group 5	Group 6
Group 1	8	0	0	0	0
Group 2	0	6	0	0	0
Group 3	0	2	6	0	0
Group 5	0	0	0	8	0
Group 6	0	0	0	0	8

Since the learning process classification structure was originally derived from student learning outcome perceptions we can return to the starting point using only those students included in the final combined data analysis. Repeating the original discriminant analysis based on learning outcome perceptions we can determine the extent to which the small final sample duplicates the learning outcome structure of the total sample from which the groups were derived. If our limited final sample is representative of the original population the Centour diagram produced by the discriminant analysis based on their learning outcome perceptions should be very similar to that produced by the analysis of the data from the original population. If they are not, the two diagrams should exhibit different characteristics.

Figure 12.6 is a reproduction of the Centour diagram based on functions one and two of the discriminant analysis of the learning outcome responses from the original group samples (Group 1, 39; Group 2, 75; Group 3, 37; Group 4, 42; Group 5, 42; Group 6, 69). (See Figure 12.6, page 12-32.) Figure 12.7 contains the Centour diagram produced when the learning outcome responses from the students making up the final combined data sample were analyzed following the same procedure. (See Figure 12.7, page 12-33.) Except for a slight shift in the axis of the latter plot the original and limited sample diagrams differ only in the absence of group four from the final analysis and in the size of the dispersion which is to be expected given the smaller number of observations in the second analysis. With these exceptions the plots are, for all practical purposes, congruent.

The Centours of Group Centroids Matrix generated by the new analysis (Table 12.12) confirms the absence of overlap among group members based on the learning outcome perceptions of students in the final combined data sample. (See Table 12.12, page 12-34.)

Figure 12.6 Centour Diagram Based on Discriminant Functions 1 and 2 for Learning Outcome Responses of Original Samples

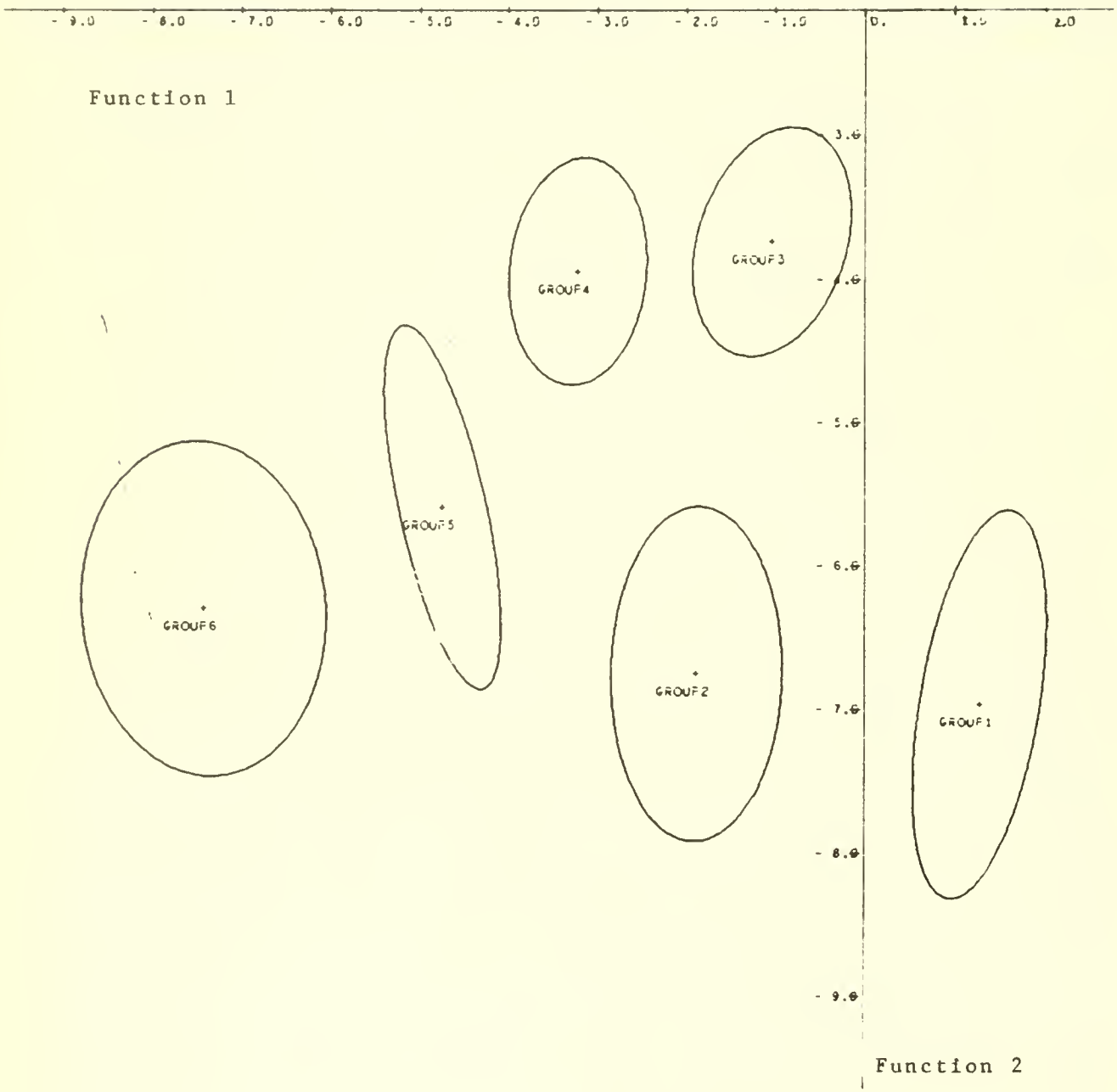


Figure 12.7 Centour Diagram Based on Discriminant Functions 1 and 2 for Learning Outcome Responses from the Reduced Sample of Learning Process Groups

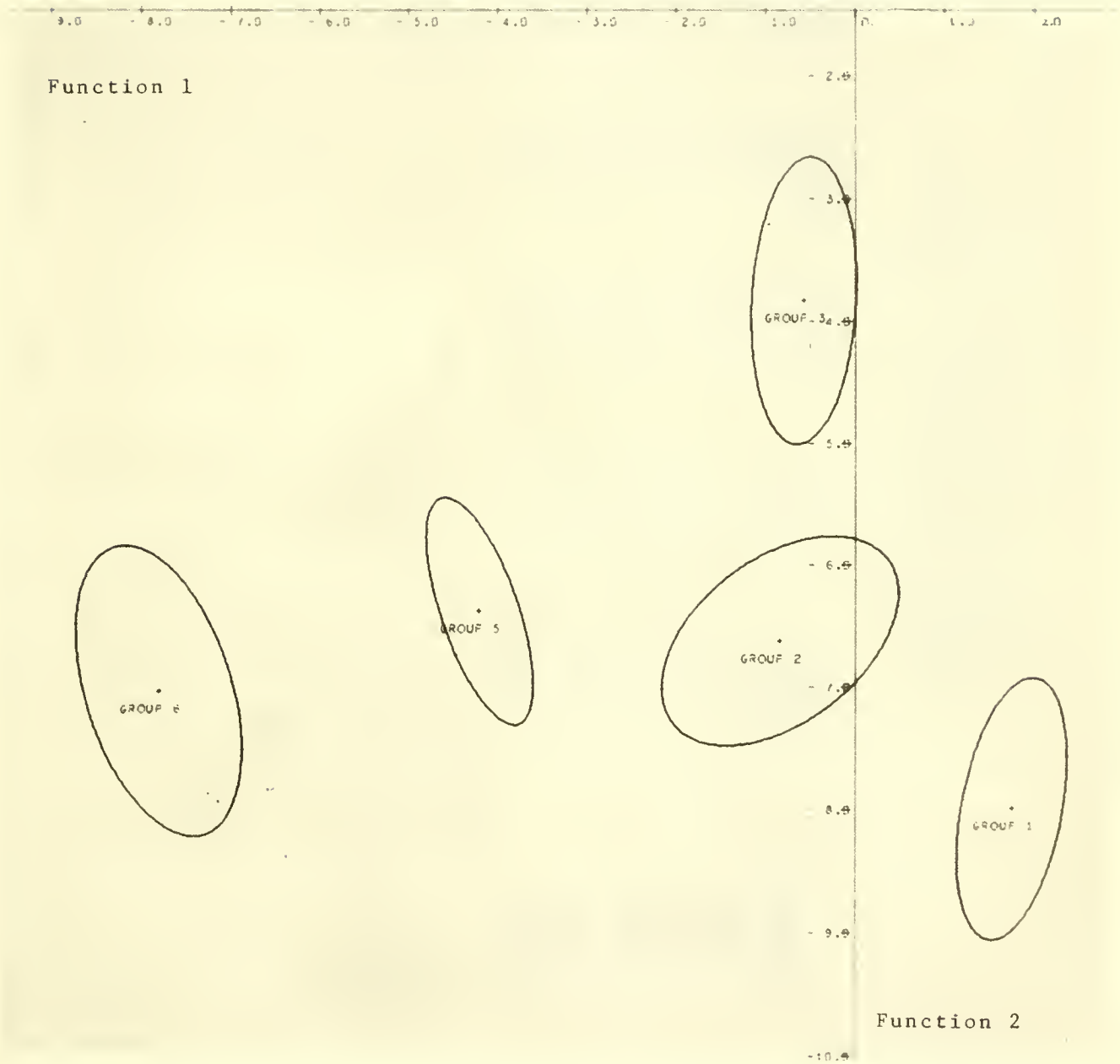


Table 12.12

Centours of Groups Centroids Matrix
From Discriminant Analysis Based on
Learning Outcome Perceptions of Students
in Final Combined Data Sample

Variable	Centroid Group 1	Centroid Group 2	Centroid Group 3	Centroid Group 4	Centroid Group 5
Group 1	100.0000	0.2276	0.0000	0.0000	0.0000
Group 2	0.0000	100.0000	0.0402	0.0000	0.0000
Group 3	0.0000	0.0028	100.0000	0.0000	0.0000
Group 5	0.0000	0.5962	0.0000	100.0000	0.0004
Group 6	0.0000	0.0000	0.0000	0.0000	100.0000

The final acid test is to determine whether the chi square classification procedure will correctly assign the members of the final combined data group to the appropriate learning process categories given only their learning outcome perceptions. Table 12.13 summarizes the results of this procedure. All members are correctly assigned to the appropriate learning process classification. The validation could not be more perfect.

Table 12.13

X^2 Prediction of Group Membership

Verification of Reduced Learning Outcome Groups

Original Group Membership	Predicted Group Membership				
	Group 1	Group 2	Group 3	Group 5	Group 6
Group 1	8	0	0	0	0
Group 2	0	8	0	0	0
Group 3	0	0	6	0	0
Group 5	0	0	0	8	0
Group 6	0	0	0	0	8

Chapter 13

Policy Implications

> "The power to guess the unseen from the seen, to trace the implications of things, to judge the whole piece by the pattern, ... this cluster of gifts may almost be said to constitute experience".[1]

In the preceding seven chapters we have examined undergraduate and graduate education using the conceptual framework and measurement procedures established in Chapters 3 and 4 respectively. It is now time to step back from the relatively detailed analytic considerations that have occupied our thinking in Chapters 6 through 12 and to reconsider the managerial issues that determined the structure and measures used in this study. Our objective in returning to these managerial considerations is to examine the policy implications of the preceding analysis.

The organization of this discussion will parallel that used in Chapter 4 as we developed "... measures for those points in the (educational) process where additional information might lead to more rational, effective, or efficient policy formulation and decision making." In this chapter we will examine the broader policy implications of the research findings derived from these measures. Then, in Chapter 14, we will turn to operating issues associated with the implementation of these policies.

The Entrance Process

The Chapter 4 discussion of the process through which students apply to, are accepted by, and decide to attend an educational institution was sum-

[1] Henry James, The Art of Fiction.

marized in the flow chart reproduced in Figure 13.1. The seven major measurement points noted in this figure identify the central aspects of this process which will be the focus of this discussion of policy implications. The seven points are:

- Content of institutional communication
- Attributes of prospective program applicants
- Attributes of program applicants
- Information available to and used by those responsible for the admissions process
- Characteristics of students accepted and rejected by the admissions process
- Distinguishing attributes of those accepted for a program who decline to attend
- Attributes of students entering the program.

Institutional Communication

The managerial issues surrounding institutional communication center on two questions: "How important are various sources of information to prospective applicants?" and, "Do students applying to a graduate school share that institution's self image?"

The Role of Formal (Printed) Communication

The limited communication oriented student data reported in Chapter 7 suggest that substantial emphasis should be placed on the quality and content of published communications[1] since approximately one third of the "meaningful information" on which an applicant bases his choice of institutions comes from school catalogues.

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[1] See: Information Sources Chapter 7, page 7-6.

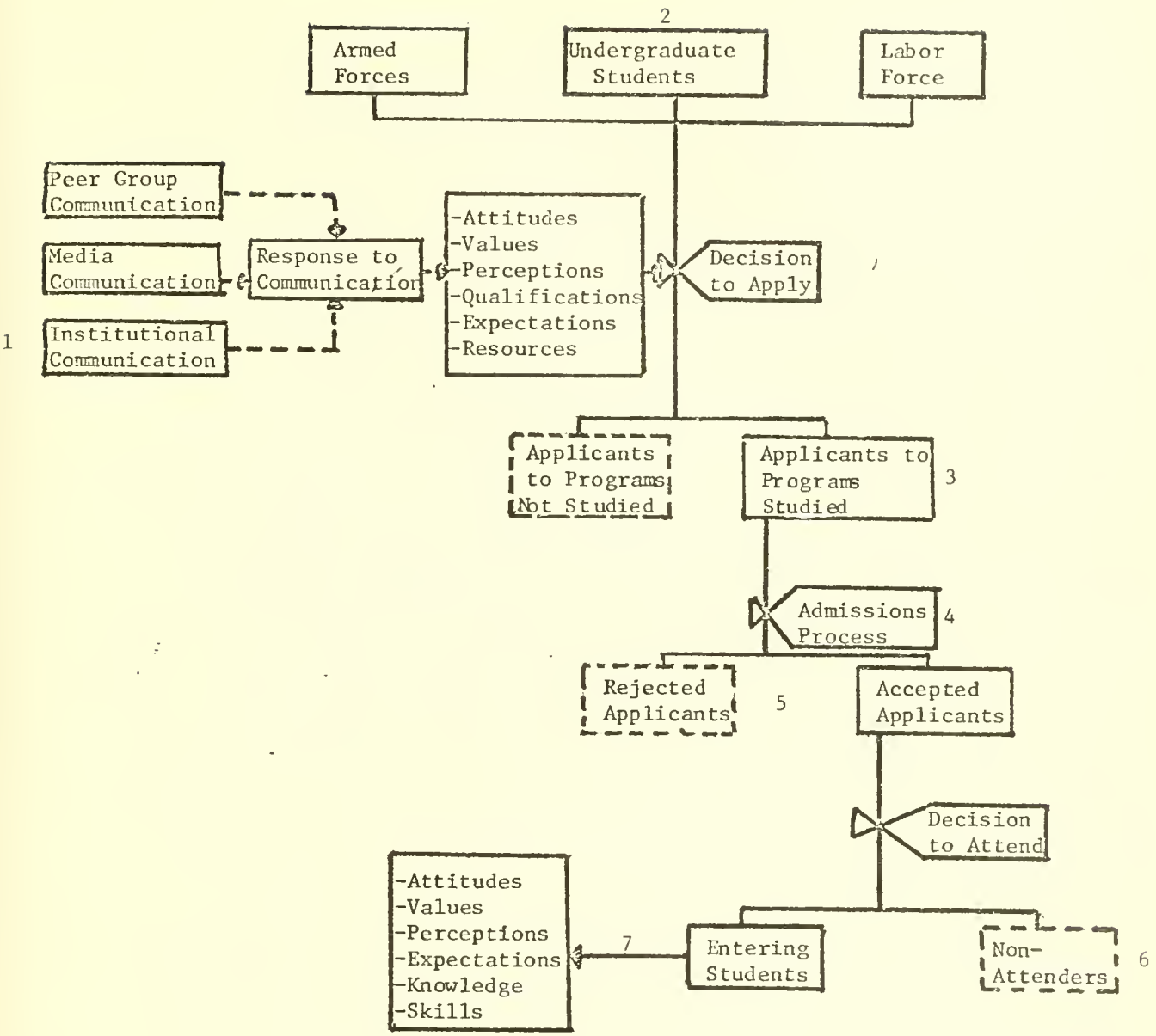

Figure 13.1. The Graduate Program Entrance Process

On first examination the most important information source, "word of mouth", may appear to be outside the administrators' sphere of action. However, closer scrutiny is clearly justified. In the absence of more detailed research it may be reasonable to assume that the content of word of mouth communication is largely determined by those with first hand experience (students and alumni) and the public media. If this is the case, administrators may be well advised to pay close attention to the attitudes and perceptions of his current customers and insure that alumni are provided with persuasive promotional material that can be passed on to interested prospects.

The limited analysis given this subject suggests that administrators interested in changing fundamental attitudes toward graduate management education should emphasize the specifics of program structure, course content, and teaching methodology in their communications. Students reporting a change in attitude toward management education during the application process consistently referenced this type of information as the basis for their attitude change.

Presenting the Institutional Image

In this period of decreasing applications and financial stringency, competition between schools to attract well-qualified students has become intense. In an apparent attempt to lure students into the fold, many schools are stressing the uniqueness of the educational experience they offer and the unusual opportunities available to the student who attends. The facts, as perceived by university administrators and interpreted by Harold Hodgkinson in a survey of 1,230 college presidents, appear to contradict these claims.

> ...In fact with all the talk about the heralded pluralism of American higher education and the necessity of continuing a diversity of institutional types, one is struck by the similar direction of trends across public, sectarian and non-sectarian lines. One can make a strong case from this data that there is a blurring of individual institutional uniqueness and an increased centralization so that all institutions tend to respond to social stimuli from the culture in approximately equal amounts. Whether this is good or not is for the reader to decide, but it is very clear from our data that the diversity by type of control is decreasing in American higher education. This also would lead one to question the doctrine of "institutional uniqueness" which is one of the major factors that eliminate change in American higher education. The idea that each institution has a unique background and a unique history and therefore responds to incentives and pressures from the society in a unique way is certainly not borne out by these data. All institutions are becoming far more alike by institutional control than they are different. Thus higher education in America is becoming more homogenized than was true in the past.[1]

While Hodgkinson's analysis of administrative perceptions may be accurate, our data reveal significant differences among faculty members at the five graduate schools with which the study was concerned.[2] Assuming that the alert administrator may wish to take advantage of these differences and emphasize his school's unique position on relevant dimensions, what will the focus of his communcation be? Our analysis suggests that a school like Southern Methodist might comment on its faculty's interest in consumers and marketing functions as well as their emphasis on state and local government

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[1]Hodgkinson, Harold L., Institutions in Transition, A Profile of Change in Higher Education, McGraw Hill, New York, 1971, page 71.

[2]See Differences Among Faculty Pre Course Expectations at the Five Schools, Chapter 8, pages 8-32 to 8-38.

and community organizations. On the other hand, the Amos Tuck administrator would be well advised to build on his faculty's concern for learning mechanisms in the classroom and their interest in giving students "hands on" experience through simulated in-class activities and projects outside of class.

Assessing Applicant Perceptions

An even more important policy issue is the validity of the expectations held by students applying to the institution. Data developed in this analysis suggest that, at least at the Sloan School of Management, there are significant discrepancies between the expectations of students applying to that school and those of the faculty responsible for the program they hope to attend.[1] Students show greater concern for policy formulation, communicating and selling ideas, inducing change and improving their self confidence. The faculty meanwhile is most concerned with creative thinking and problem solving ability. Students and faculty also differ in their expectations regarding classroom activities. The students expect more independent research papers, projects in industry, visiting lecturers, interaction outside of class, and group projects while the majority of the faculty neither plan nor deliver this type of experience.

While the specifics of such discrepancies are a function of the institution, the existence of such inconsistencies raises basic policy questions. Does the administrator wish to change the program to bring in-class realities in line with student expectations? Or would he prefer to provide an accurate description of existing conditions in the belief that students

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[1] See "Student and Faculty Learning Outcome Expectations", Chapter 8, pages 8-39 to 8-55.

wishing to interact with a faculty of the type he employs will then be motivated to submit applications? There is, of course, a third alternative. He may elect to "let sleeping dogs lie" and attempt to correct his institution's image at a later point in the process. Adoption of this option must be based on the assumption that accurate communication would have an adverse effect on the quality of applicants and that the inevitable dissonance resolution process will not irreparably damage the student's educational experience.

Promotion Policy

Logical extension of the communication issue will ultimately bring college administrators to an even more fundamental policy issue: should they advertise? Practically every college has its alumni magazine. However, these vehicles tend to be primarily concerned with keeping alumni informed of each other's successes, developments at the college and the importance of financial contributions. Some institutions have become involved in broader based communication efforts, For example, at M.I.T. The Technology Review presents the M.I.T. image to a subscription list that is approximately one third non-alumni.

With the increasing availability of special interest magazines, general space advertising in publications with editorial content closely paralleling the interests of potential applicants becomes a serious possibility at M.I.T. For example one might find significant numbers of potential applicants reading Science Magazine, Scientific American, or their own Technology Review.

Potential Applicant Attributes

Our analysis of potential applicant attributes was limited to students in undergraduate programs. As such it excluded members of the armed forces and the labor force. Undergraduates are undoubtedly the most managerially relevant subset of the potential applicant population since a majority of students entering graduate programs in management come from this segment and the mechanisms for communicating with undergraduate students far exceed those associated with other population subgroups.

Demographics

Data generated in this study suggest that a majority of the applicants to any graduate program will have fathers who are professional, executives, or self-employed; and are quite likely to have a mother who works. Applicants to graduate management programs are most likely to have been from undergraduat engineering, economics or business.

While our overall undergraduate sample lacked non-academic experience, those contemplating graduate study in management exhibited the highest relative experience levels.

Educational Expectations

Responses obtained from the undergraduates indicate that those considering graduate study in management are least interested in independent reading and research but lean heavily toward projects in industry, summer

or school year jobs in industry, and interaction with people from industry.

Job Expectations

The majority (55%) of those contemplating graduate study in management expect their first job to be with a large company. Another 28% expect to work in a small company. Therefore a total of 83% expect to work in the private rather than the public sector.

Potential Sources of Conflict

These findings have definite policy implications for management programs currently emphasizing the development of non-industrial, public sector oriented curricula. While management faculties become enamored with these more socially relevant activities, the majority of their prospective students continue to have a strong industrial orientation. Potential applicants' negative attitude toward independent reading and research as well as research oriented faculty interactions has further implications for curriculum planning and program emphasis.

Even more important is the realization that 52% of those contemplating careers in management expect to be working for themselves by 1990 and an additional 33% plan to remain in "big business." Salary expectations add further support to this relatively pragmatic profit orientation. While recognizing that initial salaries will be relatively low (in the $5,000 - $15,000 a year range), twenty-year expectations indicate that 67% of those entering management expect to be earning more than $30,000 by 1990 while 27% and 8% expect to be in the $50,000 - $100,000 and over $100,000 annual income brackets respectively.

Our findings that prospective management students are particularly concerned with opportunities for high earnings and advancement, as well as

authority associated with a job indicate that the administrator committed to meeting the perceived interests and needs of these applicants may be forced to mediate a value conflict between students and faculty.

The many business school faculty members currently turning away from traditional management concerns and directing their efforts toward ecology, urban renewal, family planning, health care, and other activities more compatible with their perception of "social good" undoubtedly share the previously noted U.S. News and World Report perception that "among today's undergraduates there is a renewed interest in politics, religion and community service."[1] While this assertion may be valid for the vast majority of undergraduates, our data suggest that those considering careers in management deviate significantly from the group norm.

Applicant Attributes

The value systems implied by our analysis of potential applicants' attributes is confirmed by the data obtained from students applying to the five graduate schools of management included in this study. When asked to identify their reason for choosing a particular school, the members of this population attached least importance to community involvement while placing greatest emphasis on location; prestige of school, field of specialization; and cost and financial aid offered.

School Images

The analysis of applicant attributes identifies ten characteristics responsible for image differences across the five schools studied. These are: quantitative emphasis, research opportunities, strength in specific fields of

[1] Chapter 1, page 1-19.

interests, social opportunities, size of school, prestige of school, use of case studies, integrated program, location, and faculty. While this list identifies the characteristics of graduate schools to which applicants are most sensitive, it is important to recognize that only two of the five schools succeed in establishing an image that is significantly different from that of all four remaining institutions. Further, both schools' uniqueness is attributable to a single attribute -- quantitative emphasis distinguishes the Sloan School from other institutions and size of school produces a unique image for Amos Tuck.

These data imply that the administrator intent on establishing a unique image for his institution faces a difficult task. The manager who truly believes that his program has a unique image in the market place would be well advised to test the validity of this important assumption.

Applicants With Experience

With the current emphasis on continuing education it may be useful to note that our analysis of the total populations failed to uncover any consistent and significant differences between the small sample of students with non-academic experience and the larger group who apply while completing their undergraduate program. Significant differences between experienced and inexperienced applicants were noted at individual schools and, while the specifics were unique to each particular institution, the overall impression is that experienced applicants are less impressed (or more critical of) most attributes emphasized by their less experienced colleagues.

Subjective Perceptions

Perhaps the most important policy implication to be derived from the analysis of applicant attributes is that the administrator should give

explicit consideration to the subjective perceptions and expectations of the students applying to his institution. These factors may be important determinants of the applicant's ultimate ability to contribute to and benefit from the educational experience offered by a particular program.

The Admissions Process

The Chapter 7 analysis of admissions procedures focused on a single institution, the M.I.T. Sloan School of Management. Data obtained from students and faculties associated with the other graduate programs reveal characteristics similar to those encountered at M.I.T. However, we have no parallel studies of the decision process at other institutions against which to test the M.I.T. model. Policy implications drawn from our admissions process analysis are therefore limited to problems and issues known or supposed to exist in most universities.

The Inevitability of Procedures

The first implication of this analysis is that some form of relatively structured admission procedure is probably inevitable. The M.I.T. experience clearly shows that even in the absence of explicit rules, intelligent men charged with making admission decisions will invoke an underlying set or procedures incorporating relatively consistent value judgements and a limited number of qualitative and/or quantitative measures.

The Quantitative Bias

Francis Rourke and Glenn Brooks comment knowingly on the academician's schizophrenic attitude toward quantitative measures in their book, The Managerial Revolution in Higher Education.[1]

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[1] Francis E. Rourke and Glenn E. Brooks, The Managerial Revolution in Higher Education, (Baltimore: The Johns Hopkins Press, 1966), page 9.

As is the case with all organizations that produce intangible products and employ a large number of highly skilled professional staff members to achieve their goals, the output of institutions of higher education does not readily lend itself to quantitative measurement. Judgments about many aspects of institutional productivity must ultimately be based on qualitative rather than quantitative standards of achievement and, in the absence of agreed-upon objective criteria, must ultimately be highly subjective in character.

It would be foolish, however to refuse to accept any use of quantitative techniques in the management of colleges and universities. There are many aspects of administrative performance which are as measurable in institutions of higher education as they are in any other organization-the cost of taking care of buildings and grounds, for example. Furthermore, the area of academic performance itself is not altogether immune from quantitative assessment.

The truth of the matter is that the academic community has traditionally made much more use of quantitative criteria in making judgments on educational policy than it has usually been prepared either to recognize or acknowledge. Very often, however, this reliance upon factual data is not made explicit but is more or less "smuggled" into the decision-making process. As a result quantitative data may actually exercise much more influence than would be the case if the facts were brought into the open where they could be subjected to critical scrutiny. For example some deans who would stoutly deny that their decisions are made on a quantitative basis will actually be found, upon close inspection, to be leaning upon highly subjective and often erroneous factual assumptions in framing universe policy.

Of course the introduction of quantitative measurement into the field of educational policy has its own pitfalls. There is always the danger, to which all organizations are subject, that quantitative standards will tend to drive out qualitative criteria altogether.

The M.I.T. experience corroborates the contention that those involved in an administrative process tend to grasp at quantitative measures. The reason for this bias is quite elemental. Quantitative references simplify complex and frustrating classification problems. There may be a tendency to question the generality of conclusions based on the behavior of M.I.T. faculty members who are expected to have a "quantitative orientation". However, data supplied by the Educational Testing Service demonstrate that the M.I.T. faculty's use of ATGSB scores produces entering student distributions comparable to those generated by faculties at institutions with less quantitative images.

The Search for Heterogeneity

Administrators seeking a heterogeneous student body may argue that this objective precludes the use of explicit admissions criteria and that their goal can best be achieved by "netting out" unstructured individual biases. This approach ignores the high cost of faculty time allocated to the cross-cancelling exercise and assumes the existence of an effective balance of power within the admissions group. Even in the extreme case the administrator can achieve his objective with greater efficiency and confidence by adopting an explicit procedure. Random or stratified selection based on a Monte Carlo process can provide cost effective access to his goal.

Inputs to the Admission Decision

Since several inputs evaluated in the M.I.T. study are available to many graduate schools, it may be useful to comment on those measures which were considered to be particularly significant or ambiguous:

- The ATGSB total and mathematics scores were viewed as decisive indicators of native and mathematical ability respectively;

- Past academic performance, as summarized in grade point averages was a primary basis for faculty assessment of native ability and motivation;

- Prior participation in outside activities and acquisition of leadership roles were viewed as indicators of future leadership potential;

- Structured comparisons provided by those preparing letters of recommendation were interpreted consistently by most faculty members, while attempts to assess letters of recommendation produced highly variable results;

- The student's written plan for graduate study was an important input to the evaluation of applicant maturity, motivation, and seriousness of intent.

Faculty Decision Making

Our examination of individual Admissions Committee member behavior produced the following broadly applicable conclusions.

- In the absence of specific criteria, individual faculty members base their decisions on a very limited number of factors and will be strongly influenced by quantitative aptitude and academic performance measures.

- When using a predefined evaluative structure, individual faculty members place differential emphasis on selected elements of that structure.

- Involvement with the development of an evaluative structure increases commitment to the process and breadth of utilization.

- Procedures based on historic group decisions may duplicate group behavior without representing the decision process of any single group member.

Computer-Aided Decision Making

While it is unlikely that most administrators will consider implementing a computer based admissions procedure, the results obtained using the computerized evaluation described in Chapter 7 have distinct

policy implications. The increasing cost of qualified human resources may expand existing pressures to introduce some form of automated screening in large scale evaluative activities such as the admissions process. The manager faced with these realities may be encouraged or appalled by the observation that "...the most striking difference between the computer and faculty (application) readers is the computer's willingness to make decisions. The computer classified 88 of the 99 applications presented to it while the faculty readers assigned A or B ratings to only 64".[1] Whatever his feelings he cannot ignore the cost of human deliberation nor deny the capriciousness of much human endeavor erroneously classified as "decision making".

Characteristics of Accepted and Rejected Applicants

The administrator concerned with current or future admissions policy may wish to use the descriptors discussed in Chapter 7 to examine the qualifications of accepted and rejected applicants to his program.[2] These measures and procedures, as well as the M.I.T. faculty's interpretations of them, are biased by perceived strengths and weaknesses of the M.I.T. program and their preferences for particular types of students. However, the ten evaluative dimensions which emerged from the M.I.T. effort provide a useful reference for independent admissions criteria development. These are:

- .ability to "structure" - to organize complex situations
- .academic performance
- .non-academic experience
- .interest in the profession to which the school is committed
- .demonstrated and potential leadership skill

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[1] Chapter 7, page 7-41.

[2] See "A Model for Applicant Evaluation", Chapter 7 pages 7-16 to 7-33.

.technical background and proficiency

.motivation

.native ability

.seriousness of intent -- commitment to the program, and

.commitment to acquiring the specific competence emphasized by the program.

Characteristics of Accepted Applicants Who Attend and Decline

The Chapter 7 analysis of accepted applicant decisions to attend a program offers several potentially useful mechanisms for reducing administrative uncertainty regarding entering class size. While it would be inappropriate to apply the measures generated at the Sloan School directly to other institutions, the administrator interested in estimating acceptance rates may wish to test similar measures in his environment, obtain the data required to classify applicants according to their relative probability of accepting and make those responsible for admission procedures aware of these indicators.

The Obvious Quesiton

The question "How certain are you of your decision to attend this particular graduate school?" proved to be a simple, direct, and highly significant acceptance predictor. Ninety-five percent of those who indicated absolute certainty regarding their decision to attend became members of the entering class.

Demographic Determinants

Two demographic characteristics proved to be significant indicators of an accepted applicant's probability of attending the Sloan School. These were the timing of the decision to apply to the program and service in the armed forces.

Analysis of responses to the question "When did you decide upon this program of graduate study?" revealed that those who ultimately attended the program made their graduate study plans during their junior or senior year in college or after working. In contrast, the largest number of those who did not attend made their decision immediately after graduating from college.

The question "Have you served in the armed forces?" led to the discovery that applicants with prior military experience were significantly less likely to appear on registration day than those who had not served in the armed forces.

Learning Outcome Expectations

Evidence obtained from M.I.T. applicants indicates that learning outcome expectations may have a significant influence on the decision to attend a program. Those who declined emphasized expected program impact on their ability to analyze problems and their acquisition of knowledge of business principles while discounting influence upon their knowledge of techniques. In contrast, those who were to attend anticipated that the program would change their ability to do research. It would appear that individuals seeking specific knowledge and skills are more apt to attend M.I.T. than those interested in acquiring broader abilities and perspective.

Personal Opinions

The personal opinion data provide additional insight into the applicant's decision to attend a program. Those who declined placed greater emphasis on the corporation's social and community responsibilit and appeared to be more group oriented than those who attended.

This distinction is particularly interesting in light of the previously observed attitude differences exhibited by undergraduate students contemplating careers in management and those considering other professions. The attitudes of those who declined to attend the Sloan School are more closely aligned with their non-managerial colleagues than are those who made a commitment to study management at Sloan.

Entering Student Attributes

The final effect of communication, promotion, and admissions policies is the student body attending the institution. Students entering graduate programs focusing on the single profession - management - may be expected to share certain goals, values and expectations. It is reasonable to assume that noted differences are attributable to policies controlled or influenced by the administrator; namely, the region from which applicants are drawn, admissions procedures, and communicated program and institutional images.

Demographics

The analysis of demographic data presented in Chapter 8 identified ten dimensions accounting for significant differences among students attending the five graduate schools included in this study.

Observed differences in religious affiliation are largely attributable to regional population distributions and historic institutional affiliations. The noted variations in level of religious commitment may provide a useful indicator of student attitudes and orientation. However, it is unlikely that this measure will figure prominently in any administrator's policy framework.

The remaining differentiating demographics are more operational. They include work experience, service in the armed forces, undergraduate major, timing of the decision to pursue graduate study, plans for doctoral study, field of specialization, father's employment and first job objectives. Specific implications associated with each of these measures are discussed in Chapter 8. The relevant policy consideration is simply that differences of the type noted among the institutions studied can be maintained or changed by the administrator, and may bias or limit the ensuing educational process.

Perceptions and Expectations

In view of the large number of dimensions considered in the perceptions and expectations analysis, it was surprising to find only five factors that produced significant differences among the entering student groups at the five graduate schools. Given the breadth of available image elements, the administrator may be somewhat discouraged to find that the three most significant school attribute discriminators perceived by entering students were: school size, location and emphasis on extra-curricular activities. Fortunately the two remaining factors provide some support for proponents of substantive program development. These are: academic specialization (which includes quantitative emphasis, reserach opportunities, and field of interest); and emphasis on the use of case studies.

These findings suggest that the administrator promoting a program to potential applicants must recognize the fundamental constraints imposed by size, location and campus environment. On the other hand, once these factors are taken into account, the efforts to differentiate his institution's offerings from those of potential competitors should focus on program specifics including qualitative versus quantitative perspective, research activities, and strong fields and subject areas.

Finally he should not ignore the educational methods used in his program, recognizing that prospective applicants are sensitive to and biased toward particular pedagogical approaches.

The single item on which total agreement was achieved among members of all five entering classes also deserves comment. Students entering five programs shared a common expectation that graduate study would significantly improve their "ability to make decisions". The course content implications for those planning graduate programs in management are self evident. The broader policy implications are even more interesting. Existence of a widely shared expectation regarding the results to be achieved from a particular type of professional education establishes a common denominator for all programs oriented toward that profession. Individual institutions may differentiate their offerings by emphasizing image elements of the type noted above. However, they cannot neglect the single common element without losing their credibility as an institution preparing individuals to enter the profession.

Self Perceptions

Popular stereotypes had led us to expect that the self perceptions of students entering the five graduate schools might differ markedly. However, the data not only failed to confirm these expectations but revealed that students choosing to enter graduate schools of management possess astoundingly homogeneous conceptions of their actual and ideal selves and a typical manager. This is not to imply that these images are finely honed. They are not. However, an administrator at any of the five schools studied would be incorrect in assuming that students entering his institution have a self image or concept of the management role which differentiates them from those entering the four other graduate

programs.

This condition introduces an interesting area for managerial speculation. Since we have established that students choosing management have distinctly different perceptions from those selecting other careers, it is interesting to hypothesize reactions to a program emphasizing the development of a particular approach to the managerial role with concomitant attention to the acquisition of associated managerial traits. Just imagine the campaign promoting the virtues of this program by describing "the kind of a man who..."

Personal Opinions

The analysis of personal opinions revealed three issues which separated students entering some, but not all of the schools studied. The first was orientation toward unions; the second, social responsibilities of management and organizations; and the third, importance attached to corporate politics and "knowing the right people".

The presence of distinct opinion biases on the part of students entering certain institutions offers another potential basis for institutional identify formation. A program could be differentiated from the herd on the basis of committment to a particular "point of view". This concept is not wholly consistent with academic tradition, and might ruffle some faculty sensibilities. However we have established that students entering some schools have distinct biases, and prior research using the same opinion measurement instrument applied in this study revealed less-than-objective faculty perspectives.[1] While faculties may include representatives of dissident points of view, it is not

[1] See Edgar Schein, "Attitude Change During Management Education," Administrative Science Quarterly, 2(4): 601-628, March 1969.

not likely that all or a major portion of students are exposed to a balanced cross section of these opinions. So, why not develop a program based on a point of view, promote it's bias (only be sure to call it a 'perspective') and bring together students and faculty with similar attitudes toward key managerial issues?

The Educational Process

Continuing with the structure established in Chapter 4, we turn now to the education process illustrated graphically in Figure 13. 2. This flow chart identifies five major points in the educational process which will be the basis for this discussion. They are:

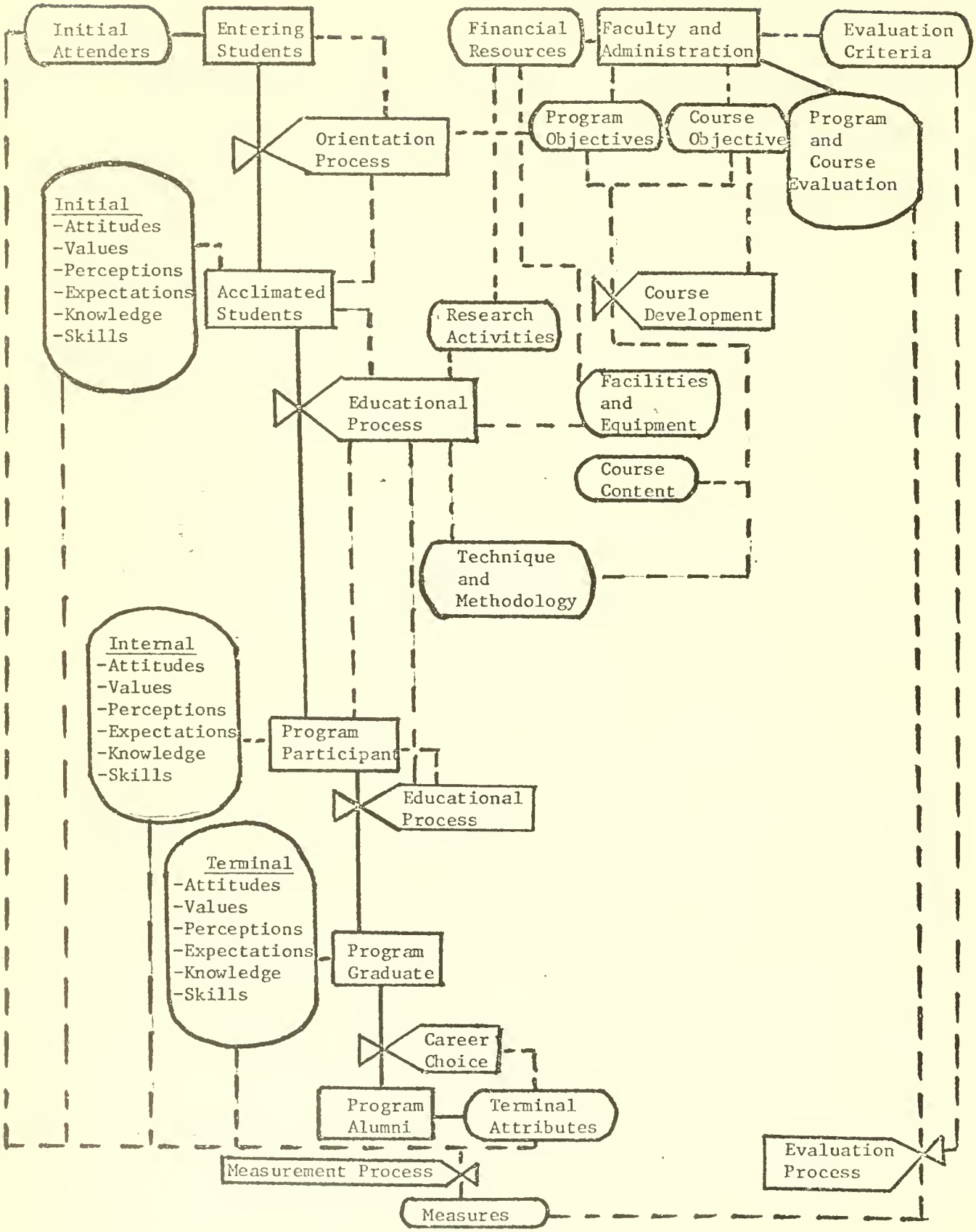
- .Formulation of program objectives
- .Course development and formulation of course objectives
- .The classroom interaction process
- .Overall change attributable to the program
- .Course specific changes in student attributes

Administrative issues associated with the formulation of program and course objectives, resource allocation, budgeting, program and course evaluation, and the impact of measurement procedures used to obtain information about the program will be discussed in Chapter 14.

Formulation of Program Objectives

Our evaluation of program objectives at the five graduate schools focused on the aggregate intentions of faculty members teaching courses monitored by the research. We contended that, in summation, the combined plans and expectations of these individuals provided an accurate representation of actual implemented program objectives. This approach clearly assumes that a program is the sum of its constituent parts.

Figure 13.2. The Graduate Education Process



Since student interaction with a program is largely limited to experience in particular courses, the assumption seems justified.

Data entering this analysis were obtained from the Professor Pre-Course questionnaire which asks the faculty member to specify plans and objectives for "his course" in terms of expected learning outcomes, learning mechanisms to be employed, and the disciplines, functional material, and conceptual structures that will be used to organize course content.

The analysis summarized in Chapter 8 identified similarities and differences among five graduate programs measured on the Professor Pre Course dimensions.[1] The specific conclusions reported in Chapter 8 are not as relevant from a policy point of view as is the fact that consistent and distinct program objectives could be identified and validated using these measures.

The success of this portion of the research effort demonstrates the feasibility of defining explicit objectives for the program as a whole and delegating responsibility for achieving these goals to instructors teaching individual courses. Administrative implications of this approach to program management are discussed further in Chapter 14.

Course Development and Formulation of Course Objectives

The classification analysis presented in Chapter 10 showed that individual courses can be consistently classified on the basis of measures of the type incorporated in the Professor Pre Course Questionnaire. It is therefore possible for the policy level manager to provide explicit policy guidelines at the course group, as opposed to single subject, level.

The course groupings established in Chapter 10 suggest that the most

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[1] See: Faculty Expectations in Five Graduate Management Programs, Chapter 8 pages 8-27 through 8-38.

appropriate basis for course classification is a combination of traditional functions or disciplines, learning outcome objectives, and learning mechanisms. Labor Relations, Organization Development and International Business emerged as clearly defined units paralleling current functional groups. However many traditional function or discipline-oriented distinctions were eliminated. For example, Mathematics, Operations Research, Systems, and Operations Management were combined in a single class. Similarly courses focussing on information systems were combined with accounting-oriented finance subjects.

Classroom Interaction

The analysis summarized in Chapter 11 demonstrated that the course classification structure could be further subdivided into six "learning process groups". Evaluation of classroom interaction patterns reported by students participating in each type of educational process showed that inter-process differences could be described and measured in terms of perceived changes along four learning outcome dimensions: interpersonal relations, managerial skills, knowledge of business, and personal insights. The administrator can therefore measure and evaluate the effect of particular courses and subject groups in terms of their contribution to changes in basic student capabilities.

It is appropriate that in the graduate schools of management the single most significant basis for discrimination among the six learning process groups is perceived change in "managerial skills". The consistency of the change patterns associated with specific types of courses (for example, the high level of change on the interpersonal relations and personal insights dimension associated with Organization Development courses) adds to the consistency and credibility of this conceptual structure. The resulting framework is simple, concise, and based on sufficiently broad concepts so that the administrator is able to relate

data from the structure directly to course and program objectives.

Naturally the specific learning outcome dimensions identified in the graduate management context will not be duplicated in other professional programs. However, similar processes can be isolated and the same methodology can be used to establish the learning outcome dimensions and educational process distinctions present in the new environment.

Program Evaluation

The policy level educational manager asked to demonstrate the educational impact of a particular academic program will generally note the apparent success of its graduates, the quality of its faculty, the reputation of his institution, or the grades program participants receive on standardized examinations. The analysis undertaken in Chapter 9 was designed to provide an additional, educational process oriented basis for assessing program impact in terms of the change perceived during a single academic year. The objective of this analysis was to identify the dimensions along which consistent change appeared to occur at both undergraduate and graduate institutions, and to determine whether students at different schools exhibited similar or divergent change patterns.

Undergraduate Program

Responses from the undergraduate environment reveal a surprising stability in the student's image of the institution he is attending, expectations as to how much certain activities will contribute to his career objectives, relative importance attached to various job attributes, and perceptions of self, ideal self and the typical manager.

The most significant undergraduate shifts detected were in the amount of change that the students expected would take place as a result of their participation in the academic program. These changes were predominantly negative. In addition to the negative changes occurring at individual schools, two learning outcome expectations were reduced significantly at all undergraduate institutions studied. These related to program impact on student ability to analyze problems and to think creatively. Students at all except one school exhibited significantly reduced expectations regarding their program's potential contribution to their ability to communicate ideas.

Graduate Program

Analysis of the change attributable to participation in the five graduate schools revealed that the most significant shifts involved expectations regarding the contribution that particular activities or learning mechanisms would make to career objectives. The next three most significant areas were: image of the graduate school, change expected to take place as a result of participation in the program, and perceptions of a typical manager.

The first three educational process oriented change areas relate directly to the communications and admissions issues discussed earlier in this chapter. It was evident from the earlier analysis that discrepancies between student expectations and institutional realities would have to be resolved through participation in the program. These data clearly demonstrate that they were. The policy questions must be: Could and should such shifts have been avoided by more accurate communication to potential applicants? If not, were the programs at these

institutions designed to achieve a net positive gain while reducing the inevitable dissonance?

Obviously we are not equipped to answer the first question, and adequate response to the second requires detailed evaluation of the school specific distributions presented in Chapter 9. However, at the risk of simplistic generalization, we might hypothesize that the student's net reaction to his encounter with "reality" would be revealed by changes in his image of the institution creating that reality. A check of the changes in institutional image occurring in the undergraduate and graduate environments produces marginal evidence; 7 out of 10 graduate, and 3 out of 5 undergraduate changes are negative.[1]

Educational Process Oriented Change Attributed to Particular Courses

The course specific change analysis reported in Chapter 9 demonstrated that the perceived impact of a particular course could be consistently measured and evaluated along the learning outcome dimensions, and that the relative effectiveness of various courses in achieving particular educational objectives could be compared on these same dimensions.[2] Administrative aspects of course specific evaluation are discussed in Chapter 14. However, two broader policy implications should be noted here.

Monitoring without Meddling

Measurement along the learning outcome dimensions provides the policy manager with a tool for assessing the success of particular courses in achieving program objectives. The use of factor-scored data

[1] See Chapter 9 pages 9-14 and 9-29.

[2] See Chapter 9 pages 9-42 to 9-45.

protects instructors from high level "meddling" in the detailed operations of his course while providing the policy level manager with the ability to monitor individual course contributions to the broad program objectives.

Exception Reporting

The experimental course situation summarized in Chapter 9 demonstrates that the factor-scored measures can accurately reflect the nature of intra-course problems without burdening the policy manager with reams of detailed output. This case study illustrates the ability of learning outcome process measures to detect actionable situations as they occur, and provides a useful example of the potential for policy level management by exception.

Retrospect

In the introductory chapter of this book we excerpted portions of a memorandum questioning "the validity of change oriented activity in the absence of explicit program objectives and measures, however crude, of the efficiency and effectiveness of existing and alternative educational procedures." This memorandum further suggests that the design of simple models, measures, and criteria for assessing the impact of educational activities might improve educational program mangement by providing the basic tools requisite to systematic planning and control.

The most fundamental policy implication of this study is that such models, measures and criteria, "however crude", have been designed, tested to within the limits of available data, and experimentally applied. On balance, the findings referenced in this chapter indicate that significant gains may be realized from a process oriented, measurement based approach to the formulation, communication, and evaluation of educational policy.

Chapter 14

Program Management - Experiences and Recommendations

"It was marked, in large black letters,
'Office of the Manager -- Keep Out.'
So Jurgen opened this door."[1]

When reviewing this research from the perspective of the manager responsible for the quality and focus of an academic program, we were interested in identifying findings that might influence the formulation and communication of relatively broad policy guidelines as well as the criteria and mechanisms to be used to evaluate a program to insure that policy level objectives were achieved.

Overview

This chapter surveys the educational environment from the point of view of the operating administrator as opposed to the policy level manager. Assuming the existence of reasonably comprehensive policy guidelines of the type discussed in Chapter 13, it examines the models and measures developed in the preceding chapters in terms of their contribution to program management.

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[1] J.B. Cabel, Jurgen, Chapter 44.

While recognizing that the program management function is often shared among several administrative positions and faculty committees, in the interest of simplicity we will presume a single composite "program manager" except when discussing faculty/administration interactions. In some respects this simplifying assumption defines away a major portion of many program management difficulties. A line manager with clear program authority and commensurate resource control would be able to avoid many of the internecine conflicts that inevitably accompany ambiguous organization structures and committee management.

The first problem facing our hypothetical program administrator is to insure that he and the policy level manager share common perceptions of the educational objectives that are to be achieved by the program. This goal setting activity involves defining the "business to be managed" and establishing the criteria that will be used to determine the success of that business.

Throughout the discussion of policy level issues it was generally possible to avoid mentioning revenues, costs, deficits, and other numismatic terms repugnant to commercially chaste academic sensibilities. With elliptical references to "resource allocation and utilization," we were able to

maintain the traditional academic aloofness from fiscal specificities.

Unfortunately, in this chapter we were forced to abandon our scholarly outlook and to enter that twilight zone where students and research projects are easily mistaken for "sources of revenues;" "faculty" becomes a salary classification; research and teaching assistants are seen as expense items; normally charming secretaries take on the features of "overhead;" and the serenity of the quiet summer campus may be seen as "non productive capital asset utilization."

Since the program manager must work through and with members of the university community, it will be necessary to leave the sunbathed beach of concepts and goals and plunge into the murky depths of organizational problems.

We will also be concerned with the processes through which program objectives are converted into course offerings, staffed by reasonably competent instructors using acceptable pedagogical techniques in adequate facilities to develop skills, transfer knowledge, or otherwise contribute to student development, happiness or sense of well being.

Our consideration of administrative control will include fiscal as well as educational measures of course performance and program effectiveness.

We will even venture to comment on faculty as well as student selection, and criteria and procedures for prospect identification, evaluation, selection, orientation, care, feeding and expulsion.

The observations and recommendations presented in this chapter are based on our experiences developing and applying the models and measures discussed in earlier chapters to the Master's Program at the M.I.T. Sloan School of Management between 1967 and 1971. We have tried to recount the often frustrating but at times productive steps taken by the Master's Program Committee and this research group as we endeavored to model, manage and measure the operation of this single, relatively small graduate program.

Establishing Educational Goals

Those unfamiliar with the subtler aspects of academic virtue may expect to find a strong interest in goal setting and financial integrity exhibited by faculty members associated with a management program. Such expectations reveal a fundamental lack of understanding of the long established role of "Good Businessman" in the university community. The following definition published in 1908 is included for the benefit of those who have not previously encountered this phenomenon.

> "A Good Businessman...is one whose mind has not been warped and narrowed by merely intellectual interests, and who, at the same time, has not those odious pushing qualities which are unhappily required for making a figure in business anywhere else. He has had his finger on the pulse of the Great World -- a distant and rather terrifying region, which it is very necessary to keep in touch with, though it must not be allowed on any account to touch you. Difficult as it seems, this relation is successfully maintained by sending young men to the Bar with Fellowships of L200 a year and no duties. Life at the Bar, in these conditions, is very pleasant; and only good business men are likely to return."[1]

The "Business" of Education

Earlier in this chapter we suggested that educational goal setting involved "defining the business to be managed" within the academic institution. Viewing an educational activity, even a graduate management program, as a business appears inappropriate to some, perverse to others. Certainly there are differences between the traditional concept of corporate purpose and the classical view of the university's raison d'etre.

Management of a business, at least theoretically (and over the long run) is dedicated to the generation of profits and return on investment. The corporate executive is expected to choose among alternative activities on the

[1] F.M. Cornford, Microcosmographia Academica Being a Guide for the Young Academic Politician - 1908, reprinted by Massachusetts Institute of Technology, Education Research Center, Cambridge, Massachusetts, 1972.

basis of potential contribution to earnings. At times he may deviate from this primary goal in the interest of penetrating new markets, developing new products, expanding production capacity, increasing sales volume, or otherwise improving the firm's ability to generate profit at a future time. However, with certain notable exceptions, the corporate manager is judged on his ability to generate earnings growth or at least to convince stockholders of the imminent emergence of same.

Managerially useful educational goal setting is greatly hindered and, at times, precluded by the extreme breadth of the contemporary role defined for and by the university.

> "In the United States, because of its role as socializer, credentialer, producer of technicians, scholars, politicians, and soldiers, the university stands in a pre-eminent position among contemporary institutions. Because of the image it has projected and which often has been forced upon it, the university has become the church of a modern secular and technocratic society. It has been touted as the solver of all problems, the reservoir of all ideas, and to a large extent it has accepted these various roles. In fact, it often has assiduously and aggressively sought them.
>
> It is no wonder in these circumstances that the university becomes a focus of social and political attack by all who are dissatisfied with society as it is."[1]

[1] Ralph A. Dungan, "Higher Education: The Effort to Adjust," Daedalus, Winter 1970, p. 141.

The weakness inherent in attempts to apply the business model to academia derives from the traditional absence of managerially useful and objective performance measures in the university environment. This is not to say that academic programs suffer from an absence of proposed goals. The difficulties arise when one attempts to demonstrate modest progress toward achievement of particular objectives. Consider, for example, the following "functional objectives" proposed in a recent issue of Daedalus.

> "Certain objectives or elements of the higher educational experience should be common to any option or curriculum. Of these, the most important would seem to be cultivation in the student, the institution, and the society of a respect for learning; an appreciation and knowledge of the contemporary social and political environment; a facility in communication; and an appreciation of non-material values -- religious and artistic."[1]

How is the conscientious administrator to assess his effectiveness in cultivating "a respect for learning...in the student, the institution, and the society?"

Even corporate administrators may have difficulty justifying their ultimate effectiveness in comparably global terms. However, they can always take refuge in the success of their product line in meeting the needs of a consuming public. But what is the educator's product? And, who are

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[1] Ibid., p. 144.

his consumers? Attempts to answer the product question inevitably degenerate into circular tautologies.

> "When we want a loaf of bread or a carton of milk, we go to the grocery store for it. When we want 'education,' we go to school for it. Just as the grocery store purveys food, we think the school purveys education. When the father asks his son, 'What did you learn in school today?' he expects a definite, substantive answer. If the son replies, 'I learned that 2 plus 2 equals 4,' the father is satisfied.
>
> This concept of education as a packaged and wrapped commodity long ago became a stereotyped attitude in our society; indeed, it began to develop soon after institutions called 'schools' were established to provide for the formal instruction of the young and to induct them into the culture. As a result, over the years we have indoctrinated ourselves with the notion that education is what goes on in schools. 'Finish your education before you get married,' parents tell their children. 'To get a good job, get a good education,' we hear repeatedly on our television receivers."[1]

Efforts to identify relevant consumer populations to which the university should respond are generally plagued by standards of relevancy that shift in response to constantly changing issues of public concern. The policy level administrator no longer relates to a specific and limited public with whom he can communicate directly.

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[1] Arthur E. Lean, And Merely Teach, Carbondale, Illinois: Southern Illinois University Press, 1968, pp. 4-5.

> "One important difference between the older specific and differentiated publics and the emerging mass undifferentiated public is that the former reflect specific interests that can be met, or compromised or educated, or resisted. A mass public, by contrast, does not have interests so much as fears and angers -- what it communicates to the trustees is 'why can't you clean up that mess at the university -- all those demonstrating students and unpatriotic faculty.'"[1]

The product line issue is further complicated by traditional faculty attitudes toward course offerings. While corporations voice concern when their product lines become over burdened with items that fail to generate significant sales levels, university faculties maintain unswerving commitments to "important" electives that consistently attract less than five students including listeners. Meanwhile, 87 students jam the only available section of a basic course held in a classroom with seats for 45 taught by a graduate student or first term instructor because the senior faculty do not find it sufficiently "challenging," i.e., relevant to their current research or publication interests.

The mention of faculty research interests makes it appropriate to note that the issue of synergism and conflict between research and educational objectives will be deferred

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[1]Martin Trow, "Reflections on the Transition from Mass to Universal Higher Education," Daedalus, Winter 1970, p. 10.

to a later section of this chapter. For the moment, we will be concerned only with the educational program ignoring the unpleasant reality that many research-oriented faculty members will participate grudgingly if at all in that professionally unrewarding chore, teaching.

The M.I.T. Experience

The sequence of events leading up to the Sloan School Master's Program Committee's 1968 goal setting efforts was noted in Chapter 1. These deliberations quickly established a limit to the scope and extent of near term program size. The normal Master's Program would continue to follow a two year (four semester) schedule with an entering class each year limited to one hundred students. Experimental programs involving twenty-five to thirty-five students might be considered if requisite staffing could be arranged. The major focus of debate during this period was thus the appropriate output of the Master's Program.

Discussions during the Spring of 1968 were often structured in terms of comparative attributes of the Masters and Ph.D. level programs. In June 1968, the committee concluded that...

> There is general agreement that the orientation of the masters program should be differentiated from that of the Ph.D. program along the dimensions illustrated below. The Ph.D. candidate looks to a discipline oriented group for approval while the Masters candidate sees a functional group or operating organization as his reference group.

The common elements of both programs at M.I.T. is emphasis on problem structuring via Systems Analysis.

Ph.D.		Masters
Thinker	⟷	Doer
Theory	⟷	Application
Analysis	⟷	Decision Maker
Depth	⟷	Breadth
Criteria Generation	⟷	Criteria Weighting
Cause (Why)	⟷	Effect (What)
Discipline Oriented	⟷	Results (Action) Oriented
Problem Structuring ←	Systems Analysis	→ Problem Structuring

The Masters Program should focus on the right side of these dimensions. Criteria for program evaluation should be stated in these words or related concepts.[1]

By December 1968, the committee had "...established a limited set of objectives (dimensions) which might be used to describe alternative master's programs." The word "alternative" should be emphasized since minutes of meetings during that period reveal a continuing caution that dimensions specified be applicable to "...a number of programs and not just one particular program." This concern grew in part from concurrent discussions of three potential types of Master's Programs defined in terms of the future activities of their graduates. These were:

- A scholarly program producing future Ph.D. candidates
- A professional program for those entering private or group consulting or the management of large enterprises

[1] Excerpt from June 1968 Sloan School Master's Program Committee minutes.

- An entrepreneurial program graduating innovative line managers.

The dimensions and measures finally accepted were thought to be sufficiently comprehensive and yet specific to encompass and differentiate among these three program types. They were subdivided into "Student Oriented Objectives," "Objectives Associated with Program Administration," and "Objectives Relating to the Program Faculty," as follows.

Student Oriented Objectives

Objectives for alternative programs were stated in terms of four dimensions. The first three relate to ends while the fourth focuses on means.

- Knowledge acquisition relating to:
  - The managerial environment (e.g. institutional considerations, the corporate structure, government relations, competition...);
  - Disciplines (quantitative, economic and behavioral) with associated functional areas and inter-relations among same;
  - Available hardware and software applicable to qualitative and quantitative analysis of managerial problems -- technology.
- Awareness and consideration of:
  - Attitudes -- regarding self, professional role, and management practices.
  - Recognition of the limits of one's own training.
  - Acceptance of responsibility and willingness to exercise authority -- the role of decision maker.
  - Career objectives stated in terms of:
    - position -- manager, consultant, Ph.D. candidate
    - institutional context -- business, government, and education
    - functional emphasis -- generalist, finance, marketing

    - disciplines -- quantitative, economic or behavioral
  - Values -- ethical, social, human, and professional
  - Ideals -- for self, organization, profession and society
- Skill in:
  - Developing frameworks for analysis and synthesis
  - Communication -- persuasive and effective written and oral communication
  - Working with others -- motivation, exercise of authority and responsibility, sensitivity
  - Inducing change -- ability as an agent of change.
- Experience and involvement in a learning environment:
  - Exposure to realistically complex problems in management environments -- the opportunity to make decisions (mistakes) and to learn to live with the consequences -- feedback
  - Exposure to real world problem contexts -- involvement with real world constraints impeding the introduction of change
  - Acceptance of organizational responsibilities -- project to other group responsibilities requiring effective motivation and the exercise of leadership skills
- Interaction with:
  - Faculty in classroom and common interest contacts
  - Fellow students -- masters, undergraduates, Sloans, and Senior Executives
  - Managers and administrators offering live data against which initial student perceptions may be validated or rejected
- Self-directed Education -- a commitment to a continuing learning experience

<u>Objectives Associated with Program Administration</u>

Administrative objectives for various Master's Programs were assessed in terms of the following dimensions:

- Integration of functional areas

- Emphasis on course development
- Departmental autonomy
- Effectiveness of the feedback process -- mechanics for continuing supervision
- Efficiency -- good allocation of resources -- how much overlap
- Flexibility of course requirements
- Communication effectiveness -- faculty awareness of administrative objectives and associated reward structure
- Extent of experimentation -- continuing course development and integration

Objectives Relating to Program Faculty

While the Master's Program Committee believed that faculty-oriented objectives could only be considered in the context of specific student and administrative objectives, desired faculty characteristics and orientation were specified along the following dimensions:

- Attitude -- toward management, education and research
- Priorities -- utilization of time and resources
- Capabilities -- skills and interests
- Breadth -- coverage of disciplines and educational approaches
- Development -- extent of experimentation and adoption of new teaching techniques and approaches
- Integration -- contiguous scheduling, avoidance of overlap and continuity among courses
- Extent of communication -- interaction among groups and within program regarding objectives, approaches and content

Generating these dimensions and criteria proved to be far simpler than applying them to the formulation of specific program objectives.

Definition of the type of manager the program would produce proved to be relatively straightforward. The Committee chose a path midway between the professional and entrepreneurial

alternatives noted earlier and was able to agree on six perceptions and seven traits that would be impressed upon the minds of program participants.

> The Sloan School Master's Program will prepare students to function effectively as professional managers in public or private organizations.
>
> The Program will produce a manager who views himself as:
>
> - Action oriented -- a producer of results
> - An agent of change
> - Committed to quantitative measurement of opportunities, plans, results
> - A model builder
> - A persuasive communicator
> - A transfer agent -- user and diffuser of innovative ideas, methodologies, and techniques
>
> Program graduates will approach management problems in a particular way. Specifically, they will:
>
> - Apply systems analysis -- have unusual ability to structure complex problems
> - Communicate effectively
> - Continue to learn after leaving M.I.T.
> - Evaluate alternatives using objective criteria
> - Make decisions in the presence of uncertainty
> - Produce results -- impact on their environment
> - Understand and be sensitive to people [1]

All recognized the impossibility of attaching equal importance to all traits and attitudes. However, major complications emerged as the Committee attempted to go beyond

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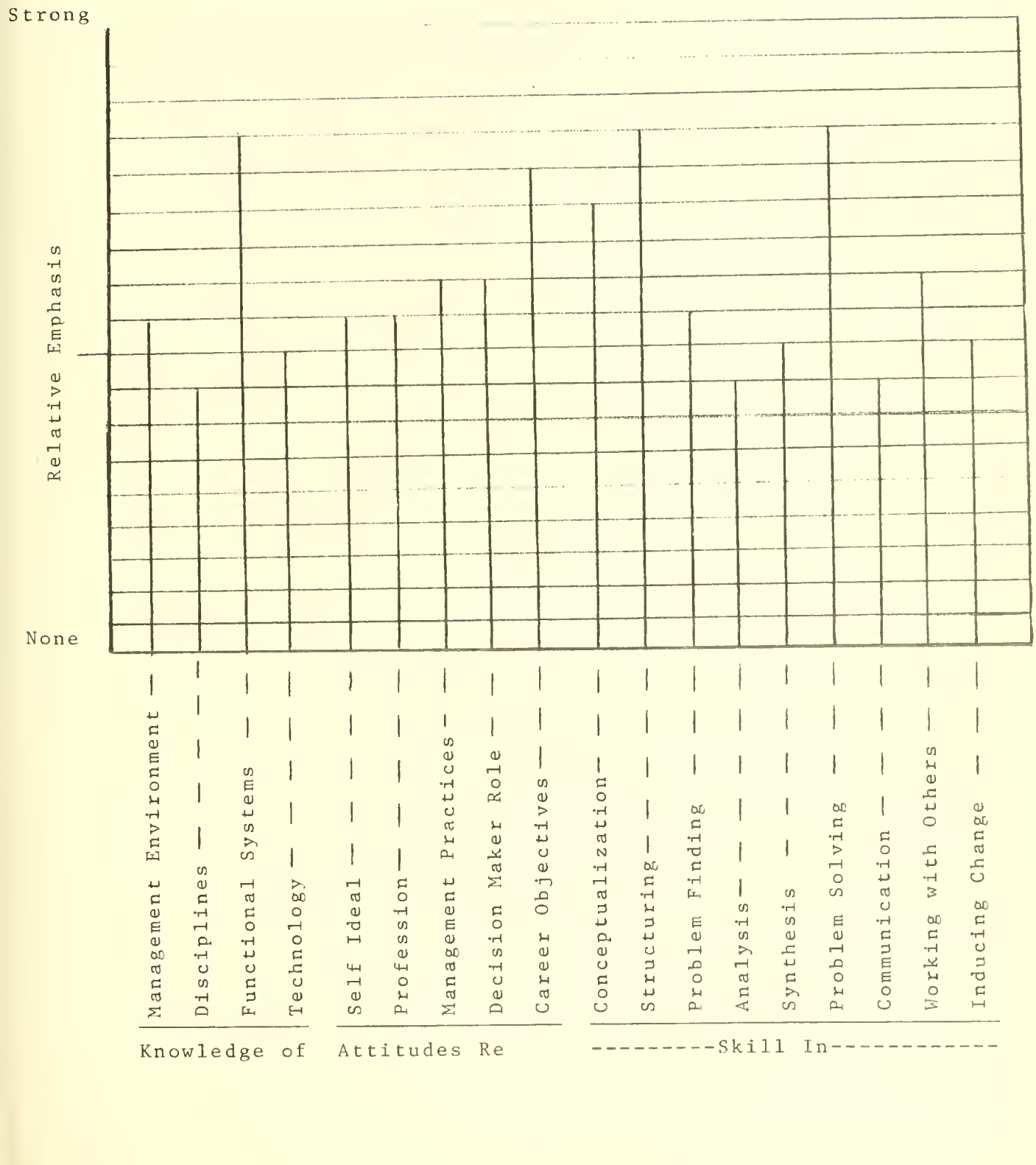
[1] Excerpt from March 20, 1970 memorandum to the Master's Program Committee from A. E. Amstutz.

these lists to establish the relative emphasis to be given each program element. The problems were predictable. Each Committee member emphasized certain dimensions believing that they should be allotted prime time in the program schedule. Quantitative representation led to dissention by making explicit that which had been implicit but repressed -- different individuals had conflicting objectives for the program.

Averaging the course specific value judgments rendered by members of the Master's Program Committee at a mid point in the formulation process produced the composite statement of program objectives illustrated in Figure 14.1. This cumulative display describes the collective perception of appropriate program goals in terms of the relative emphasis to be given selected subsets of knowledge, attitude and skill change.

Several characteristics of the resulting profile deserve comment. First, no potential program element was omitted. Every item was allocated at least an average level of emphasis. The three elements receiving less than mid value net ratings (knowledge of disciplines, skill in analysis and skill in communication) were allotted only marginally less emphasis. The five items receiving the greatest emphasis (knowledge of functional systems, attitudes regarding career objectives; and skill in conceptualization, structuring, and problem solving) were not unanimously chosen although above average importance

Figure 14.1 Preliminary Program Objectives



was attached to the three highest ranking elements by all Committee members.

Once the process of program definition had begun, an important transition occurred. Committee members no longer debated the feasibility of quantitative objective setting. Instead their arguments focused on alternative learning outcomes and career orientations.

Examination of the career outcomes issue involved the way graduates should be prepared to fill particular roles -- their approach to management -- as well as the definition of career patterns they might select. Data from this research indicating the differences and similarities in ideal self and typical manager perceptions among students entering the five graduate schools were catalytic in producing this stress. Noted differences in faculty learning outcome expectations sensitized Committee members to the variability of existing instructor orientations toward this issue.

The single most frustrating aspect of the career orientation question was the belief that students must be prepared to enter currently nonexistent careers and to modify their role expectations as their careers developed. These considerations caused several faculty members to emphasize program contribution to the acquisition of "structuring" and "problem solving" skills as revealed in Figure 14.1. (See page 14-17.)

Our research findings that similarities among graduate management programs appear to far outweigh differences received further validation in the Fall of 1969. The Master's Program Committee, by then engaged in evaluating the initial success of their efforts to achieve objectives of the type noted, became increasingly aware of parallel thinking developing at other institutions. The following excerpt from a November 1969 memorandum to the Faculty and Students of the Carnegie-Mellon Graduate School of Industrial Administration is indicative.

The Master's Program in Industrial Administration

> The School's overall goal in the Master of Science Program is to educate men and women for advancement to general management positions. Designed especially for those with backgrounds in engineering, science, and mathematics, the program emphasizes the development of each student's problem-solving abilities. It helps him to acquire basic managerial tools and ways of thought as a framework for the ongoing process of self-education that will be necessary to meet the changing and increasingly complex management problems of the future. At the same time, the School's program prepares students to make useful contributions during their early years in industry in the wide variety of line and staff assignments that are open to them. Graduate education at best can provide guidance for self-development.

The Master of Science program is designed to help each student acquire:

1. Competence in Systematic Analytical Exploration and handling of problems.

2. An Integrated Understanding of Fundamental Knowledge in Industrial Administration.

3. A Basis for Dealing and Communicating Effectively with Other People.

4. The Capacity for Professional Growth Through Self-Education.

5. An Understanding of the Economic, Political and Social Environment.

6. Independent Thought and Maturity of Character.

7. The Ability to Make and Execute Decisions.[1]

Program Structure

Once the educational objectives of a program are defined, the program manager must decide how he will organize his resources to achieve the stated goals. This is the educator's equivalent of defining the "product line." Learning outcome objectives established for the program must be subdivided and attached to specific course offerings. Instructors must be found to staff these courses and, to the extent that the program manager is concerned about the way particular courses are taught, learning process objectives must be agreed upon.

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[1] Excerpt from November 1969 memorandum to the Faculty and Students of the Carnegie-Mellon Graduate School of Industrial Administration.

At the Sloan School, we attempted to formalize the program structuring process by having each program manager prepare a "program plan" during the Spring term. This document which was the first in a series of planning steps encompassed six academic terms beginning in the Fall of the year in which the plan was prepared and continuing through the Summer term two years later. The program plan was to include a detailed description of "expected changes in program and curriculum development needs, enrollments in required subjects, options or fields, and thesis or equivalent." In this section, we will review the steps taken to develop this plan with particular emphasis on the manner in which the models and measures associated with this research influenced its structure and content.

Establishing the "Mix"

The program manager can simplify the problem of creating a product mix by classifying courses on the basis of his relative concern with their content and methodology. In most cases, four general categories are sufficient to describe the elements of this mix. Ranked in order of decreasing program manager concern, these are:

- Core courses -- The basic element of the mix; the common subjects taken by the majority of course participants and, as such, the courses which must in combination achieve a major portion of the program's educational goals.

- Open options -- Specified groups of courses open to all participants; the student's option choice determines the specialized program content to which he will be exposed.

- Limited offerings -- Special subjects which because of required prerequisites, facilities or instructor preferences are limited to a small number of students.

- Theses and individual tutorials -- Specialized interactions between one or two students and an instructor usually involving a project or special interest activity.

Since the program administrator has different responsibilities with respect to each type of course, we will give separate consideration to the factors he examines when working in each of the four areas.

Core Courses

One of the most basic questions associated with the core course classification is the number of courses that should be admitted to this group. What is the smallest number of subjects which can be considered to represent the underlying concepts on which the program is founded? Viewed from the perspective of our research efforts, this question is appropriately reformulated as, "What is the minimum set of educational experiences required to produce the learning outcomes that define our program?"

A second and closely related question which is frequently debated when considering the structure of the program core is, "Should all or any portion of the core courses be required of all students participating in the program?" The issue of whether or not to permit waivers for core courses on the basis of subjects taken elsewhere (usually in an undergraduate curriculum) is sure to follow closely on the heels of any decision

to establish a required core. At M.I.T., we attempted to resolve the waiver problem by establishing explicit coordination between the undergraduate and graduate program through a graduate-undergraduate subcommittee which would maintain a faculty prepared list of courses meeting graduate level core course requirements.

Proposals to introduce a new core course (particularly a required one) are bound to raise a broad range of considerations. The following excerpts from a Program Committee meeting discussing the establishment of a new "Managerial Environment" course as part of the Sloan School Master's Program core are indicative.

> Professor G...proposed that the objectives of a Managerial Environment course should be to 'bring to the student's attention in a reasonably formal structure with sufficient depth current issues that managers are faced with in society today.' The range of possible topics was seen to include: urban development, pollution, race, technology, management and government, role of university and population. Breadth creates a problem when setting criteria for appropriate courses. The general conclusion was that credit should not be given for a previous course in English Literature, but the group could not agree on why it should not be given.
>
> Professor R... indicated importance of sensitizing each student to a broad range of issues rather than a single issue.
>
> Professor S...feared courses offered in some other departments might be counter productive with respect to our objectives. He suggested that in view of this condition we should develop our own courses with appropriate perspective and that a faculty group should be designated to 'worry about' this area. (Formation of the S... Committee' was thus inevitable.)

> Professor A... suggested that courses developed in this area should have 'an action orientation' -- that courses providing little more than 'emotional catharsis through group discussion' should be avoided.
>
> Professor H... noted the potential value of an 'historical perspective' of the type developed in earlier 'political economy' courses.
>
> Opportunities to achieve desired objectives through existing courses were considered...
>
> Professor S...was named to chair a committee charged with establishing 'a viable alternative' for implementation in the fall 1970 term and a long term faculty development activity designed to develop resources required for a strong faculty in this area.
>
> Policy Course - Noted objectives for the Managerial Environment course were (also) contrasted with those of a desired policy course....[1]

Core courses are the program manager's primary area of concern. It is the one category that he is responsible for staffing. As noted in the preceding minutes, the problems of finding appropriately qualified faculty to teach core courses (particularly those dealing with new subject matter) can present a major problem to those responsible for the program. In the following section, we will comment on the financial implications of the program manager's need to obtain faculty to staff core courses. In the present context, it is sufficient to note that core courses are notoriously unpopular with the faculty.

Since core courses frequently focus on basic material, they contribute little to the instructor's more advanced

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[1] Excerpted from the June 12, 1970 Sloan School Master's Program Committee minutes.

research interests. Since they are apt to be large (particularly if required), they represent a significant teaching load with many additional hours of out of class time devoted to student interaction and grading. Little wonder that the program manager may have trouble convincing his esteemed colleagues to teach these subjects. It is not surprising that at M.I.T. the majority of the core courses were taught by faculty who were also members of the Master's Program Committee and strongly committed to its objectives.

Options

Since option courses are subjects through which a student specializes in a particular area, they seldom create staffing problems for the program manager. Unlike core courses, options are associated with a particular functional or discipline group, involve relatively specialized material which is of particular interest to members of that group, and, at least in later subjects in the option sequence, are apt to involve reasonably advanced material which has research or publication relevance for the faculty. In addition, since students electing a particular option are expressing an interest in an area with which the faculty members teaching the courses are associated, students and instructors are likely to develop out of class associations based on common interest in course content. The concentration options offered at M.I.T. during this period were based on traditional functional areas. During the past year, the Sloan School has begun moving in the direction of technique or approach

oriented course groupings with the formation of a "management science" group incorporating several of the traditional functional areas. However, within this broader classification, individual faculty members continue to maintain a functional focus.

The concept of a concentration option assumes that a student wishes to develop a modicum of specialization in a particular area. The Master's Program Committee continued to be concerned with the possibility that a student might wish to define a concentration option that did not directly parallel existing functional or discipline groups within the Sloan School. Their approach to this issue is summarized in the following excerpt from a Master's Program Committee discussion.

> Concentration Options - A discussion of the option concept reiterated the Committee's concern with maintaining a flexible program. Each student is expected to develop a program acceptable to a faculty member and consisting of a "package" of logically interrelated subjects. When such packages differ markedly from established options, the approval of a senior faculty member in the concentration area to which the package most closely relates will be required.[1]

Thus, the student was able to "concentrate" on any combination of courses providing he could obtain the concurrence of

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[1] Excerpt from the minutes of the March 1969 Master's Program Committee.

a faculty member regarding the reasonableness of his option definition. The required degree of specialization could fluctuate widely with individual faculty member definitions of "option." This policy effectively transferred a portion of the responsibility for program definition from the program committee to individual faculty members.

Limited Offerings

The program manager's concern with courses involving limited enrollment normally focuses on the resources allocated to such subjects. In many instances, the limited enrollment is a result of the course's dependence on a scarce resource (e.g. computer time or a language laboratory) which imposes a capacity constraint on enrollment. The question facing the program administrator is whether the funds allocated to the scarce resource benefiting a limited number of students could be better utilized in other ways to the benefit of a larger portion of his program participants.

In some instances, students in one program may be offered limited access to courses offered by another department or program. In this case, the enrollment limitations may be imposed by a policy of first access to program participants imposed by the management of the other program. The issue of quota and priority setting for a course raises basic questions about the function of the program and the role of the student as consumer of the educational product. In most business con-

texts, increased demand for a portion of the product line would be met with investment to increase capacity and hence the ability to provide more of the product to the waiting consumers. While the program manager may attempt to exhibit this type of response to demand, his ability to react quickly may be limited by the availability of unallocated resources and/or the willingness of faculty members to teach the course in question. For these and other reasons, educational programs may frequently emulate the behavior of the New York Stock Exchange which, in the face of unusually heavy business during 1969, responded by shortening its hours of operation.

Thesis and Private Study

The program manager has little or no concern with the specific content or methodology of individual student/teacher interactions of the type associated with a thesis or other individual or small group tutorial. He may, however, be very interested in the implications for the total program of this type of faculty resource utilization. The cost/effectiveness questions raised by one-to-one interaction may be of primary concern particularly if large core courses or high demand options are inadequately staffed.

Lack of program manager measurement of the learning outcomes produced by this type of course does not indicate that dimensions applicable to other subjects are inappropriate for use in evaluating one-to-one interactions. On the contrary, the same instruments and procedures are directly applicable. The issue is one of the value and actionability of information

collected from this type of student/faculty experience. It may be difficult to draw significant conclusions based on individual student/faculty sets. However, the aggregate impact of theses experiences across many faculty/student combinations can be assessed using the measures contained in the Course Evaluation Questionnaire.

Setting Learning Outcome Objectives

While it can be very stimulating to consider the potential merits of a new course such as the Managerial Environment subject described earlier, there are definite dangers inherent in asking a faculty member to teach a course described in the relatively general terms used in the faculty discussion. While these descriptors may provide a reasonable specification for the content and orientation of the course, they do not provide a linkage to overall program goals or permit that course to be compared to other courses across a common set of dimensions.

> We spend hours in faculty meetings arguing about requirements in each category, or whether one of them...should be eliminated entirely. But what happens in the classrooms? Do our highly specialized faculty instructors in these programs completely reorient their approaches, techniques, course outlines, tests and examinations, and so on, so as to achieve the breadth and integration for which the entire program exists? C'est a rire.

> In the first place, most professors resist such programs and submit to their imposition only unwillingly and rebelliously, while in actuality they simply rename the same old courses, tinker with the organization a bit, reduce the credit hours and perhaps drop some feature like laboratory work, and blithely go on still doing business at the same old stand but under another name....And so, with a few minor adjustments, they go on doing what they've always been doing. If it's under an assumed name, what matter? After some grumbling, peace returns to the campus.[1]

Delegating Responsibility for Learning Outcomes

The program manager adopting the approach suggested by this research will have established explicit program goals expressed in terms of the learning outcome dimensions. His approach to course specification will involve delegating responsibility for achievement of specific learning outcome goals to selected courses. The success of this delegation is dependent upon program management's ability to communicate its objectives to the faculty member responsible for the course and to motivate him to adopt and commit to these objectives. It is difficult enough to structure a course to achieve specific educational results when the faculty member is strongly committed to their attainment. In the absence of strong motivation and

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[1] Lean, op. cit., p. 56.

individual commitment to the goals, efforts to achieve specific objectives may lead only to frustration and mutual recrimination.

An Example of Course Specific Objectives

At M.I.T. a major portion of the responsibility for achieving basic program objectives, illustrated in Figure 14.1, was delegated to the faculty responsible for the core courses taken by the majority of students participating in the program. For purposes of illustration, we will examine four of these courses: Human Factors, Economics, Mathematics and Information and Decision Systems.

Each course was expected to contribute to one or more knowledge, attitude, or skill learning outcome dimension. However, the specific objectives assigned to each course differed markedly from those delegated to other subjects.

The Human Factors course was expected to produce significant changes in the student's knowledge of organizational systems; attitudes toward the decision-making role and career objectives; and skill in structuring, problem solving, working with others, and inducing change. It was not expected to contribute significantly to knowledge of particular technology or skill in analysis.

The Economics course was to emphasize student acquisition of knowledge of economic systems and skill in structurin and problem solving. It was not expected to have a strong

influence on any attitude dimensions and was assigned low priorities for affecting the student's skill in problem finding, synthesis, communication, working with others, or inducing change.

The Mathematics course was expected to have a significant effect on the knowledge of disciplines and mathematical systems dimensions as well as on skill in structuring and problem solving. Because of its focus, this course was assigned an average change objective on skill in analysis.

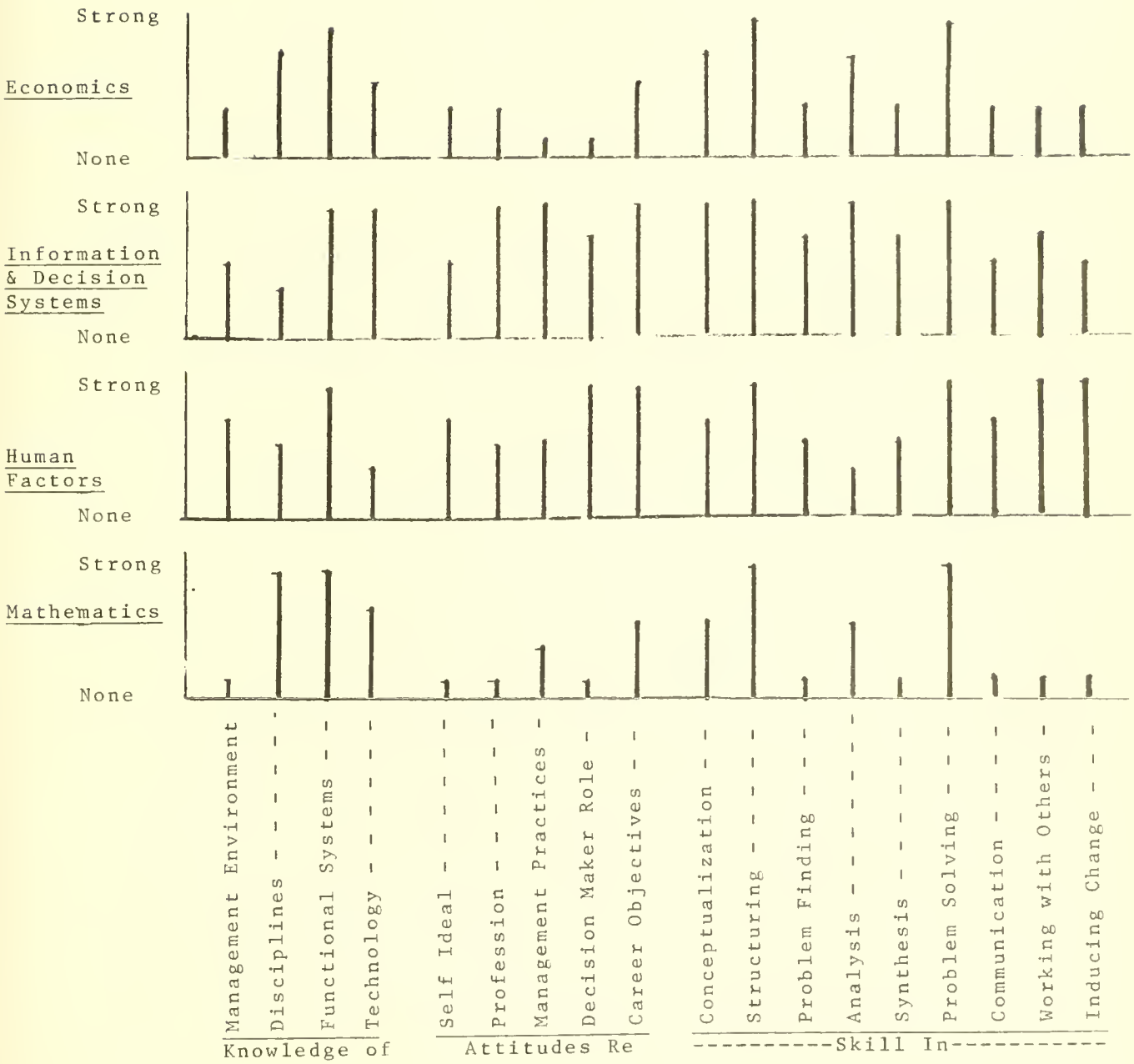
The Program Committee's high expectations for the Information and Decision System's course were revealed in the broad range of change objectives assigned the faculty responsible for its execution. This single course was expected to produce a significant change in knowledge of information systems and associated technology, as well as student attitudes toward profession, management practices, and career objectives. On the skill dimension, it was expected to affect the student's ability to conceptualize, structure, analyze, and solve problems.

These objectives, summarized graphically in Figure 14.2, are those initially proposed by the Committee. The objectives ultimately agreed upon with faculty members teaching specific courses were, in most instances, substantially less ambitious.

Course Specific Methodology

Our research conclusions regarding learning process group

Figure 14.2 Course Specific Objectives for Four Core Subjects Expressed as Relative Emphasis on Learning Outcome Dimensions



structures emphasize the importance of classroom interaction in achieving particular learning outcomes.

The first question considered by the program management and instructor responsible for the course is whether a particular teaching method appears to be especially well suited to the achievement of specified learning outcome objectives. In the previously noted Policy course, cases were believed to sensitize students to attitudes toward management practice and the decision-making role, as well as their self ideal and career objectives. In another course, a computer-based management game was used to achieve similar objectives. However, it was considered impractical to use the game methodology in courses having an enrollment above a certain size.

In other courses, specialized technology was used experimentally in an effort to maximize change along specified learning outcome dimensions. The experimental television course, (described in Chapter 10), designed specifically to maximize change along the "managerial perspective" learning outcome dimension, is indicative of this type of program structuring. The television medium proved to be unusually effective in developing "managerial perspective" through videotaped cases focusing on 'real world actualities'. The use of television support material reduced faculty preparation and presentation time and permitted less experienced faculty mentors to present more 'applications' oriented material.

The introduction of dramatically new and unfamiliar teaching methods can create difficult problems since the resulting classroom interaction patterns may deviate markedly from those traditionally expected. Under these circumstances faculty members not involved in the new course may be depended on to question its effectiveness, value and appropriateness for "This institution at this time. "Sure the students like it. It's great showmanship. But is it good education?"

> College professors and administrators are typically almost pathologically sensitive about academic respectability... Whenever a new educational proposal is made, be it in curriculum, evaluation, admissions policies, or any other area, opponents often can effectively quash it by claiming that its adoption would 'lower standards.' Usually no real proof is required; the charge alone suffices; the proposal becomes a 'dead duck.'
>
> There is much loose talk about standards, and often the most voluble users of the term would be hard pressed to define it save in terms of superimposed requirements and of relatively meaningless phrases, such as 'solid, substantial work.'[1]

In final analysis "standards" must be defined in terms of efficiency (cost in dollars or manpower) and effectiveness (measurable change along learning outcome dimensions). The references applied in particular situations will be as varied as the faculties and programs for which they are developed. The key is definition and measurement as a process, not the particular standards used.

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[1] Lean, op. cit., p. 22.

Discussions of the learning process objectives to be assigned particular courses invariably involve definition of the expected roles of instructor and students, as well as designation of the learning mechanisms that are to be assigned high priority in the course. The following excerpt from the June 1969 Sloan School Master's Program Committee planning meeting illustrates both the opportunities and problems introduced by giving explicit consideration to the learning process to be implemented in a course. It also shows the impact of student participation in such deliberations.

> Courses based on a teacher-student contract were discussed as one mechanism for establishing individualized performance measures against individually agreed upon goals. Several student members of the Committee felt that the student-teacher contract "placed real problems and real responsibilities in the student's hands". The implications of the student having 'an opportunity to fail' was also discussed.
>
> Student members emphasized the importance of 'learning about problems which you perceive as problems.' 'I want to say, I have a problem, and I want to find a solution to it,' instead of somebody else saying, 'this problem exists so you must know how to solve it when it comes up.'
>
> Various student teaching methods were discussed as mechanisms to motivate students 'to look to their peers as sources of information instead of having to get everything from a source which is not to be criticized.'

It was noted that questions of student motivation had been raised in recent years. Some members asked whether this might not be related to the draft? They contended that in earlier years we did not have the question of trying to motivate students. 'Students were motivated because they came to the Sloan School to get something, rather than to evade the draft.'[1]

[1] Excerpt from Minutes of Master's Program Committee Planning Meeting June 11, 1969.

Financial Issues

For some time the members of the Master's Program Committee had been aware that universities in general were trapped in a cost squeeze and that funds were becoming scarce. Their general perspective was one of relatively uninvolved intellectual concern at a broad level similar to that reflected in the following segment from the Preface to the Daedalus special issue on "The Embattled University".

> American colleges and universities have known financial adversity many times in their histories; it might be truthfully said that it has been their normal condition. For a brief moment, events conspired to change that situation. Now it would appear that "normalcy" has returned; private institutions are financially pressed. The political climate is altered; universities figure on the front pages of daily newspapers less for their football exploits than for their disciplinary problems. If American higher education was ever offered an opportunity to explain itself, that opportunity is presented now. To do so, however, when divisions within academic institutions and in the society are so deep, is not going to be easy. It may be the greatest obligation that falls on colleges and universities at this time.[1]

The majority of the Committee was also aware of the vast expansion that had occurred in the university environment from 1930 to 1970 with full time faculty members increasing

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[1] Stephen R. Graubard, "Preface to the Issue 'The Embattled University'", Daedalus, Winter 1970, p. xv.

from 80,000 to 500,000. Most had personal experience with the "seller's market" conditions existing during the last decade when available faculty positions swelled from less than 300,000 to over 500,000. The number of new positions created and filled in the 1960's was slightly greater than the entire number of faculty slots in 1950.

As a result of the Committee's planning activities they had recently become conscious of a pending "crunch" resulting from over capacity and decreasing demand. It was difficult to avoid drawing some personally relevant conclusions from information of the following type.

> Recent experience reveals trends which... conspire to worsen the market outlook. The graduate schools have...expanded degree output by nearly 14 percent a year. The OE's latest guess (is) that 1980 will see some 60,000 Ph.D.'s awarded. Professor Lewis Mayhew last year completed a study which suggests that institutional plans for 10 years ahead add up to nearly 70,000, without allowing for new universities which may come on the scene. A 1969 NCR projection based on 'logical' growth rates, extimates 71,460 doctorates for 1980.
>
> The other area in which the situation has changed markedly for the worse -- worse in the sense of contributing to a further potential imbalance in supply and demand of college faculty -- is demographic. Over the last 5 years, fertility rates

> have sharply declined, and today's 'under 5' population right now is 13 percent below its 1965 level.
>
> The high school class of 1979 will be 25 percent larger than the class of 1986. What this suggests is not only that total college enrollment will be expanding at a steadily decreasing rate over the coming decade, but that in the 1980's there will be an absolute decline in the number of eligible students.[1]

At an even more personal level, Committee members had become increasingly concerned with the financial implications of our own program operations. As confidence in our ability to measure performance grew, the issue of resource utilization loomed ever larger. The following excerpts from the minutes of a June 1970 meeting are indicative.

> Discussion...centered on a proposal for Program Specific Resource Allocation. Major points emerging were:
>
> - Broad disagreement regarding criteria to be used to allocate resources and to evaluate the impact of past and current allocations;
>
> - Difficult to consider allocation among programs without also discussing allocation to teaching, course development, administration, and research;
>
> - More efficient (and possibly effective) resource utilization might be achieved by more organized and structured approach to education including possible division of responsibility for content development, presentation design, and delivery;

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[1] Cartter, Allan M., "Scientific Manpower for 1970-1985", Science, April 9, 1971, Vol. 172, pp. 138-9.

- Concept of "cross hatching" area group desires with program committee objectives was proposed with resource allocation conflicts to be resolved by "confrontation" with Dean's office as arbitrator.[1]

Program Specific Financial Models

The fiscal issues considered by the Committee during this period can best be illustrated with reference to the operating financial structure of their program. This model is naive from the broader perspective of the university administrator since it ignores tradeoffs among sponsored and unsponsored research, multiple educational programs, administrative functions and broader institutional commitments. However, it can be argued that this myopic perspective is wholly appropriate for the individual responsible for managing a single program.

Revenue Sources

The program manager has two potential sources of revenue: tuition paid by students enrolled in his program(s), and transfer payments received from other programs making use of his

[1] Excerpt from June, 1970 Program Committee meeting.

program's facilities, courses, faculty, etc. Tuition payments represent the single most important revenue source at most institutions and are certainly the most directly identifiable income item on the program manager's operating statement. It is therefore interesting to examine the current "market price structure" revealed in Table 14.1 which displays the tuitions charged members of the entering classes in 1965 through 1970 by eight representative Graduate Management Programs. In view of the pending excess of supply over demand, it is thought provoking to note that all of these institutions are reportedly comtemplating "significant" tuition increases in the near future.

Cost Structure

The program manager's costs are more varied and less easily isolated than his revenues. At the Sloan School costs are divided into three relatively arbitrary categories: Direct Teaching Costs, Direct Program Costs, and Indirect Costs.

> Direct teaching costs include all non-administrative salaries and miscellaneous expenses less the portion recovered through sponsored research. Since the various student sets overlap in many subjects, these costs are allocated to programs by first identifying them with subjects and then distributing the results in proportion to enrollments. To determine subject costs, the first step is to divide the sum of instructor and secretarial salaries and benefits plus miscellaneous expense by total instructor contact hours. This

Table 14.1

Tuitions Charged By Eight Graduate Management Programs from 1965 through 1970[1]

Management Program	1965	1966	1967	1968	1969	1970
Carnegie-Mellon	$1,700	$1,700	$1,700	$1,950	$2,200	$2,500
Chicago	1,710	1,980	2,100	2,100	2,250	2,475
Columbia	1,850	1,850	1,850	2,000	2,300	2,500
Dartmouth	1,800	1,925	2,075	2,200	2,350	2,550
Harvard	1,750	1,750	2,000	2,000	2,400	2,800
M.I.T.	1,780	1,900	1,900	2,150	2,150	2,500
Stanford	1,710	1,710	1,965	1,965	2,190	2,445
Wharton	1,630	1,730	1,850	2,150	2,350	2,500

[1] Data presented in this table are taken from a November 1970 memorandum distributed to the Administration, Faculty and Students of the Harvard Business School by their MBA Tuition Policy Committee.

annual average cost per hour is then multiplied by the actual contact hours for each subject and the product augmented by any subject - specific teaching assistant, computation, and curriculum development cost.

Direct program costs include all expenses - of recruiting, admissions, etc. - not associated with teaching per se but specific to the administration of particular programs.

Indirect costs can be divided into two components: (i) Sloan School administrative overhead for which actual cost data is available and (ii) M.I.T. administrative and facility costs. The latter - physical plant maintenance, medical costs net of recoveries through fees, library maintenance and expansion, student-related administration and services (admissions office, athletic facilities, etc.), research-related administration, and general administration - are not actually allocated to departments under present accounting procedures and, for our purposes, are taken from pro forma allocations. Indirect program costs include (i) none of the M.I.T. research-related overhead, (ii) all M.I.T. student-related overhead and, (iii) a share of the remainder proportional to the ratio of Sloan School staff salaries included in direct teaching costs to total Sloan School non-administrative staff salaries. This amount is distributed among programs on a per capita basis.[1]

[1] Excerpted from a January 1971 memorandum to the Sloan School Tuition Review Committee from Dean T. Hill.

Other institutions use different aggregation and allocation rules. But, the net effect is comparable. The Harvard Business School, for example, recently structured its operating costs under three categories: Faculty Expense, Other Direct Expense and Program Overhead.[1]

> Faculty Expense includes salaries, fringe benefits and retirement contributions for equivalent full time faculty working on the program.
>
> Other Direct Expense includes admissions, registrar, public relations, course development, secretarial support, and office expenses; as well as the net operating cost of financial aid.
>
> Program Overhead includes an allocated portion of classroom, library, office and the school's general administrative expense.

The overall cost structure facing the Master's Program manager is summarized in Table 14.2 which presents the per student costs associated with programs at the M.I.T. Sloan School and the Harvard Business School during the 1969/1970 academic year. The M.I.T. figures are based on a full time equivalent enrollment of 230 students including those engaged in "Special Student" studies. Harvard's MBA program enrollment during the same period was 1490.

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[1] Op.Cit., November 1970 Harvard Business School Memorandum.

Table 14.2

Per Student Master's Program Costs
at Harvard and M.I.T. During the 1969/1970 Academic Year

M.I.T. Cost Per Student

Cost Component	$000	%
Direct Teaching	2.4	60
Direct Program	.2	5
Total Direct Expense	2.6	65
Indirect Costs		
School	.3	7
Institution	1.1	28
Total Cost Per Student	4.0	100

H.B.S. Cost Per Student

Cost Component	$000	%
Faculty Expense	1.8	43
Other Direct Expense	1.4	33
Total Direct Cost	3.2	76
Program Overhead	1.0	24
Total Cost Per Student	4.2	100

Operating Analysis

Comparison of the revenue and cost figures in Tables 14.1 and 14.2 shows per student operating losses of $1,400 and $1,500 per year for Harvard and M.I.T. respectively. These deficits are obviously financed in one way or another out of capital. The corporate executive contemplating this form of long term deficit financing would anticipate adverse Board reactions if not derivative stockholder suits. However, this type of operating statement is sufficiently commonplace in both public and private universities so that our program manager might be reacting in a reasonably consistent academic fashion if he adopted a "let the treasurer's office worry about it," attitude and turned to planning next year's batch of "special topic" seminars.

Three major courses of action are available to the administrator who chooses to disregard the ostrich option. He may (1) attempt to increase revenues, (2) endeavor to reduce expenditures, and/or (3) strive to improve the productivity of resources applied to the program.

Revenue Increases

The most obvious source of increased revenues is tuition. As noted earlier, this option is being considered by most major graduate management programs. The action ultimately taken by these institutions will hinge on factors similar to those

evaluated at M.I.T.

> In essence, the thesis...(justifying a tuition increase)...is that consumer benefits from professional education for management, as measured by prospective incremental earnings, suffice to justify beneficiary investment in such training at a level commensurate with full cost recovery by institutional purveyors of the service. Tuition should (therefore) move in rather substantial annual increments toward an upper bound of full cost recovery with careful monitoring of the effects of each increase on applications and admissions.
>
> Such action will entail some risk. Although loan sources appear adequate to meet the needs of most students, a... tuition significantly higher than that of competing institutions may serve to turn away desirable applicants and/or force some of those who do enroll to spend too much time in off-campus jobs. We regard that risk as tolerable but, in view of it, have deliberately refrained from recommending automatic progression to tuition levels sufficient to assure full cost recovery. We believe that...further moves in that direction should be contingent on finding (i) that our teaching programs are as efficient as possible given existing organizational and technological constraints and (ii) that students prepared to undertake the required investment can in fact secure adequate financing on reasonable terms.[1]

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[1] January 1971 memorandum from Dean T. Hill to Members of the Sloan School Tuition Review Committee.

A second source of increased revenues may be found in providing relatively low marginal cost products (e.g. course material) and/or services (i.e. teaching) to other departments within the institution or to outside organizations at appropriate rates. Interdepartmental activities include providing Sloan management electives for engineering students. The potential of this revenue source is clearly dependent on departmental (if not program) agreement upon transfer pricing schedules and accounting procedures as well as a requirement that the program in question maintain a positive net "balance of payments." The success of revenue generation based on sales to outside customers (industry, government and other educational institutions) depends on marketing skill, product acceptance and faculty willingness to devote time to such activities.

A third potential income source might be established by developing mechanisms for providing research and consulting services founded on expertise resident in the program faculty. The line between teaching and consulting is often imperceptibly thin, particularly in continuing management education programs. However, most faculties will righteously reject program extensions into a formal combined teaching/consulting role. In most instances, their abjuration is based on personal economics rather than scholastic idealism. They prefer to receive separate individual compensation for the latter once their credibility has been established by the former. We will return to this

topic later in this section when we consider expansion of the financial structure to encompass non-educational activities. For the moment, we will continue with our program-oriented model.

Expense Reduction

The program administrator's ability to reduce operating deficits by reducing expenditures differs markedly across various time horizons. In the short term, say less than nine months, he may be able to have a marginal impact on relatively small portions of his budget. Direct expenses for computer time, project specific supplies, reproduction of course material, telephone, travel and part-time personnel may be controlled. However, the important budget items including faculty, administrative staff, faculty secretarial support, facilities and student assistants are fixed by prior commitments. This is the primary reason that rotating faculty committees are not apt to become involved in, or have a significant impact on, program budgets. Their time "in office" is too short in reference to the planning and control process.

Given a longer term time perspective, say one to two years, the program manager enjoys a greatly increased set of options. The only limitations on his ability to control costs are imposed by his authority to control staffing, allocate resources, and vary program attributes affecting his level of

overhead absorption. The ultimate determinant of the administrator's ability to reduce expenses is the extent of his influence ("control" is simply too strong a word for most academicians) over the creation and administration of the program budget discussed in the following section. From a program as opposed to a school or department point of view, all items in the Direct Teaching and Direct Program cost categories are, or can be made, variable.

Increased Productivity

The program manager's opportunities for increased productivity relate primarily to three areas of program activity. First, he may take steps to insure full and efficient deployment of budgeted resources. Second, he may make use of technological leverage to amplify the impact of expensive human resources. Third, he may emphasize contiguous program planning and faculty scheduling to maximize the benefits gained from prior program investments in course development and faculty preparation.

Effective and efficient deployment of budgeted resources begins with explicit goal setting and ends with direct performance measurement against standard cost references. If the job to be done and the resources to be used to achieve stated objectives are clearly established in advance, and procedures to monitor both resource utilization and learning outcome

results have been implemented, this aspect of productivity control is easily implemented. Problems arise when expectations and/or evaluative criteria are ambiguous or when measurement procedures are implemented after the fact on a hit-or-miss basis.

Technological leverage may take many forms. At the simplest level, it involves preparation and advance distribution of mimeographed lecture notes which eliminate time consuming blackboard transcribing. This may be extended to the use of transparencies, slides or other forms of projectable visual material. At the more elaborate end of the spectrum, it may entail the use of computer aided instruction, videotaped actualities, or simulated game environments. The major difficulty in using technological aids is the lead time required to develop associated material, and the deviations from traditional pedagogy required for effective implementation.

Utilization of prior program investments in course development, material design, and faculty preparation requires extensive preplanning, coordination, and the ability to effect faculty time commitment tradeoffs of the type discussed in the following section. This type of productivity contravenes many traditional faculty values. It places emphasis on applying faculty time to that which can be done most efficiently and effectively with minimum marginal investment. In contrast, traditional academic

attitudes stress the new and different. There is little glamour in teaching the same course again this year, while the syllabus for "my new course in..." is always good for an extra round of advice and commiseration at the Faculty Club bar.

Investment Analysis

Capital investment analysis of the type normally applied in non academic businesses of comparable size is often non-existent at the program level in a university. This absence of interest in return on investment is due in part to the year-to-year short run perspective adopted by most program committees. It is also attributable to the general disdain with which traditional balance sheets are regarded in an environment where "...our investment is in the creation of intellectual capital -- an asset that never depreciates."

Short Term Perspective

The financial planning problems created by a frequently changing, short run view of resource utilization have already been noted. The situation is compounded when significant capital investment is involved.

The traditional tendency to approach each program year as a discrete set of events produces a financial outlook in which everything is expensed. The attitude that "...aside from buildings, furniture, and equipment, we really don't have significant capital assets..." ignores the investment inherent

in each instructor's preparation the first time he teaches a subject, in the development of course specific teaching aids including lecture notes, and in the construction of specialized facilities such as a "learning laboratory" with one-way glass and extensive recording equipment.

Personalized Capital Assets

The issue is further complicated by the tendency for particular innovations to be associated with a single faculty member or small group of instructors. As long as he or they use the development, the program is able to benefit from their prior effort. However, as soon as they move on to other activities, their investment is discarded by their successors who feel obliged to "do their own thing." There is little credit or prestige gained from carrying on in Professor X's footsteps.

This phenomenon is aptly illustrated by the current situation with respect to the Carnegie Tech Management Game. Once viewed as a major innovation and significant asset of that institution's management program, by November 1969 it had become a pedagogical white elephant.

> Everyone on the (curriculum review) Committee agrees that the Management Game provides M.S. students with an educational experience of considerable value, but with a substantial cost in time and effort by students and faculty. The...(Committee)... was unable to find a faculty member interested in the Game as a teaching or research environment. Administration of the Game is

> viewed by the faculty as a thankless, and often frustrating, chore. The Game is in need of major overhaul and revision, but no faculty member has the interest or is willing to invest the time and effort required.[1]

Buy or Lease Options

Despite the difficulties consistently encountered in attempting to amortize program assets over several years of application, adacemic administrators are generally hesitant to consider the obvious "buy" and "lease" alternatives to in-house development with attendant costs and "reinventing the wheel" inefficiencies. Some institutions do rent computer time, for example, from outside service bureaus and despite significant educational discounts enjoy substantial cost savings over those with resident computer centers. However, notwithstanding the absence of discernible differences to users of on- or off-campus "closed shop" computer installations, the fiscally more responsible data processing tenants continue to feel inferior to their C.P.U. owning or leasing colleagues. Persuasive indeed is the administrator who can effectively counter the prestige of "our computer center" with appeals to a lower operating deficit.

On the other side of the issue, the administrator whose program has produced a particularly effective course package,

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[1] From a memorandum to the Carnegie-Mellon GSIA Faculty and Students from R. M. Cyert regarding "Proposed Revision of the M.S. Curriculum," November 6, 1969.

teaching aid, or technological support capability is seldom interested in marketing it to other universities. First, he is "...really not in the business of making and selling things." Second, he is, with some justification, wary of the response he would receive from his colleagues at other institutions if he "tried to peddle" his innovation to them. Finally, he is "justly proud" of his faculty's accomplishment and not overly anxious to distribute the wealth. His program's innovation becomes a temporary basis for limited product differentiation and, while not likely to promote this distinguishing attribute to his market, he will gain satisfaction and a certain sense of accomplishment in "mentioning" it to his counterparts at other schools.

The Opportunity for Centralized Investment

University education is the last cottage industry. The largest non military public sector activity of the world's most industrialized nation has yet to adopt the most rudimentary forms of functional specialization. Thus far the academic community has avoided facing the issue of almost total redundancy by maintaining that each institution (if not each faculty member) is engaged in a unique and indispensable activity, exempt from measurement, evaluation and the financial realities of balance sheets and return on investment.

The current fiscal crisis in public and private education may be the catalyst required to change this situation. Finan-

cial necessity has begun to motivate priority setting and resource allocation. University administrators are faced with urgent and conflicting pressures to increase the relevance of course content and improve the quality of classroom presentation while reducing or maintaining existing budget levels.

> Given the nature of our present difficulties, it is foolish to insist that problems either of curriculum or government at university X must be solved by a consideration of the matter ab initio by the students and faculty of university X. Granted that they have to rule on the acceptability of the proposed structure, still the resources of intellect and ingenuity in the country at large are almost bound to be greater than their own resources, and there is nothing shameful in admitting this fact. American education at all levels is bedeviled by this multiplicity of effort. Prodigious quantities of useful time are wasted in the duplication from state to state, from school district to school district, from college to college, of the constructive activity of curriculum design and the drafting of schemes of government, when local energy should largely be devoted to the critical consideration of these matters, starting from the best models that can be found anywhere at all.[1]

Required Actions

The program manager has an opportunity to make substantial progress toward both objectives within his program while contributing to the solution of similar problems at other institutions. However, in order to take advantage of this opportunity, he must do three things which are antithetic to much of

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[1] Peter J. Caws, "Design for a University," Daedalus, Winter, 1970, pp. 89-90.

traditional program management.

First, he must objectively assess his program's strengths and weaknesses and focus resources on his area of greatest strength. This is completely contrary to traditional emphasis on strengthening weak program segments to "bring them up to standards."

Second, he must make expenditures substantially in excess of those justified by his own program; give explicit recognition to the investment nature of these expenditures; and treat the resulting product as a capital asset to be depreciated (expensed) against future revenues derived from it.

Third, he must make emotional as well as financial commitments to selling his new product to potential customers in government, industry, and universities. It may be difficult for those lacking personal experience in the university venue to realize the traumatic implications of such actions. The academician assiduously avoids making a personal commitment to anything. It is not appropriately scholarly, objective or cynical to do so. In contrast, the effective marketing man must exude commitment to his product and the benefits it offers his customers.

An Example

One of the most promising areas for centralized capital investment is Course Development which has always been a key process in higher education. It is the university's new product development activity -- the prerequisite of improved product quality and increased customer satisfaction. Course development is also a glaring example of inefficient duplication of effort. The current practice of individual instructors at thousands of educational institutions attempting to develop courses covering the same basic material is prohibitively costly to the system as a whole, produces wide quality variances, generally fails to take advantage of resources previously deployed (even within the same institution), and fails to exploit professional communication skills that have been widely applied for decades in other industries.

There is much evidence to suggest that educational efficiency and quality can be dramatically increased by focusing comparatively large resources at a single location; applying professional education, communication, and media skills to the production of a flexible product; and distributing the resulting package to a large number of locations where it can be easily adapted to the specific needs of the resident population.

The concept is exceedingly simple -- separate course content generation from student/instructor interaction. It is

analogous to isolating production from distribution and servicing in the automobile industry.

Given these strong motivations to proceed, why hasn't it been done? While specific objections can be directed toward any proposal, three objections are heard most frequently. These are:

- Faculty members are hesitant to use course material developed at other institutions.
- Faculty members do not like to let material developed by other instructors into their classes for fear of establishing unfavorable standards of comparison. This problem approaches xenophobic proportions when the "other instructor" is given the implied "glamour" of television or video tape presentation.
- Different institutions require different course content, levels of sophistication, and depth of presentation.

The NIH (Not Invented Here) Factor. Resistance to a product created at another institution is, in most instances, attributable to one of two concerns. The resident faculty member may view the outside offering as competition for his internal efforts or feel directly competitive with the professionals at the other institution producing the product.

The first constraint is most easily overcome by providing a totally professional package involving a level of resource commitment which places the externally generated product in a totally different category from the faculty member's own efforts. Clearly, the faculty member could do an equally good job if he only had access to equal resources. But, alas, he does not.

The second concern can be turned to a selling appeal by carefully matching the source institution and the course topic. An M.I.T./Computer/Information Systems linkage would be a case in point. Flexible course structure and instructor options incorporated in the package can also place the instructor in control, while careful source selection can provide the resident instructor with vicarious prestige in the adaptation of (involvement with) material produced by the professionals in his field at Institution X.

The Other Man. Resident faculty hesitance to engage in direct competition with a better equipped counterpart can be mitigated by de-emphasizing the faculty preparing the material, emphasizing the unique content and presentation of the packaged material, and frequently alluding to the actions to be taken by the on-site faculty member.

Individual Differences. The problem of accommodating individual differences can be solved by modular course contruction, flexible assignments, and optional content. The instructor who wishes to undertake extensive custom tailoring is given the necessary material, thread and patterns while his counterpart, whose primary objective is to stay one jump ahead of the student, is provided with sufficient guidance to enable him to display his ready made acquisition with the confidence and style normally attributed to custom tailoring.

Thus there are no real obstacles to capital investment in centralized course development except tradition and inertia.

Financial Management

When reduced to basics the program administrator's financial management activities can be subdivided into three tasks: (1) converting program objectives to expense or development unit milestones, (2) allocating resources to each unit, and (3) establishing and implementing mechanisms for evaluation and control of the results achieved and resources used by each unit.

Establishing Expense and Development Units

Assuming that program objectives have been formulated and transformed into course specific goals following procedures similar to those discussed in the preceding section, the major problem facing the program manager at this stage is the definition of appropriate expense or, in the case of capital investment, development units.

Some administrators may choose to consider each course as an expense unit in order to relate course specific learning outcome measures to course specific expenditures. Others may prefer to allocate resources to more aggregate groupings based on common functional, discipline, methodological, or learning outcome elements. In most instances, courses attended

exclusively by program participants will be treated separately from those shared with other programs.

Whatever the basis for unit definition, the underlying criterion for selection should be ease of relating expenditures to output measures. There is no reason to choose expense units that parallel existing organization structures. In most instances, the financial units will be smaller than any organizational entity and, as such, can be combined in a manner compatible with departmental or line structures.

Resource Allocation

The traditional avaricious orientation toward resource acquisition often changes when resource recipients recognize that they are expected to generate results in relation to funds provided and that both inputs to and outputs from their unit are to be measured against standard references. Once this process is established, the program manager in effect contracts to obtain particular program objectives through a given course, department or other expense or development unit. This contract determines the allocation of direct expense items associated with direct teaching and program cost components.

Direct Costs

In general, the program administrator will wish to place the maximum possible number of expense items in direct cost categories. His objective should be to minimize the level of

indirect and overhead charges to be allocated to expense units on the basis of arbitrary criteria. This bias will tend to favor acquisition from outside sources on an as-needed basis in preference to long term commitments to in-house facilities. The data processing center example is a case in point.

In some instances, the apparently high cost of the direct faculty component is attributable to nothing more than faulty direct costing -- the assumption that faculty time is being devoted to teaching and therefore faculty cost should be allocated on the basis of course hours. A budget founded on this premise, if it is false, can never become a meaningful basis for program management.

At M.I.T., the average Sloan School faculty member taught 2.9 hours per week in the Fall 1971 term and 2.5 hours per week during the Spring 1972 semester. During this same period, the average staff member had available 17.5 hours per week of secretarial support. This tendency of faculty members to devote the majority of their time to non teaching activities is by no means unique to M.I.T. "Relief from teaching has become a status symbol in our universities; appointments carrying light teaching loads -- or no teaching at all -- are much sought after and flaunted with great pride."[1]

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[1] Lean, op. cit., page 16.

It is perfectly fine for faculty resources to be devoted to activities other than teaching providing we do not attempt to load the educational programs with their cost. It is a simple matter to account for time devoted to sponsored research and in some instances the program budget may receive a substantial break when "full time research" faculty become involved in a course. It is also reasonable to expect a faculty member to spend a certain amount of time preparing material for publication on the assumption (which should be intermittently validated) that such preparation contributes to his teaching in the program. However, such allocations should be explicit and the output from them monitored.

One aspect of the faculty member's non teaching activity which should be faced squarely and considered in the overall financial plan, if not the program budget, is outside consulting. Such activities can contribute markedly to the faculty members' appreciation of "real world" problems and, particularly in a school of management, to the relevance of his teaching. However, there is no excuse for the cost of the faculty member's salary and supporting overhead to increase the program deficit while the individual involved receives substantial additional compensation from the beneficiaries of his services.

The solution is simple providing we are willing to face realities. Time spent in outside consulting should be recognized, budgeted, and either charged back to the faculty member or considered explicitly when establishing his level of compensation. There is nothing wrong with a major portion of those 17.5 hours per week of secretarial time being devoted to

outside correspondence providing the faculty member reimburses the institution for the time and a prorated share of office overhead, either directly or through explicit or implied salary credits.[1] The difficulty is in the hypocracy of the faculty member who wishes to play at being an entrepreneur, gaining the benefits of resultant income if he is successful, while letting the institution bear the overhead and, implicitly, the risk of his venture.[2]

Indirect Costs and Overhead

Since direct costs are linked to revenues or transfer payments, the amount allocated to a unit is not generally a matter for debate; expense charges reflect income or credits received. Indirect expenses are another matter. From the point of view of the expense unit, indirect and overhead expenditures will be made regardless of whether it is charged for them. There is no direct connection between revenues, transfer payments, or services received and the indirect costs assigned to the unit. The question of indirect cost allocation is therefore, a subject for extensive and heated discussion with each unit arguing for an allocation procedure that will minimize or eliminate its expense absorption.

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[1] Some faculty members at prestigous institutions maintain that use of facilities and secretarial support (in addition to affiliation with "The Name") is accepted as partial compensation in lieu of salary.

[2] Still another alternative is for the university to participate directly in ventures emerging from their faculties as an investor and stock holder. M.I.T. has recently begun exploring this approach through a separate M.I.T. Foundation. (See Business Week, "MIT Aims to Grow a New Rte. 128", July 22, 1972.

The choice of indirect cost allocation criteria is highly relevant to the program manager since it can determine the validity of his financial measures. He should therefore be strongly biased in favor of measures tied to overhead and facility utilization such as number of participants or the direct cost level. He should be equally definite in his opposition to "ability to pay" criteria which load expenses on productive units while protecting the economic failures. This is not to say that he will eliminate deficit operations. However, if they exist, the extent of the deficit will be known, and sources of offsetting revenue (capital investment) identified in advance. These activities then become development, as opposed to expense, units and explicit targets for return on investment can be established.

While endeavoring to minimize the number of expense items placed in indirect categories, the program manager is still left with a significant level of overhead expenses. A portion of these are attributable to his own program administration, and he may expect to receive substantial assistance from the expense units in identifying unnecessary or inflated costs in this category. The remainder of the overhead to be absorbed by the program comes from the school or institution with which it is associated. The administrator's attitude toward his absorption of these costs should parallel that taken with respect

to his reallocation to the expense and development units. Namely, allocate costs on the basis of utilization, not ability to absorb.

One of the most common fallacies when considering overhead allocation is to assume that all overhead must be allocated. There is another option, and that is to eliminate the overhead. Unfortunately the most controversial overhead items often involve institutional sacred cows -- most frequently, prestige faculty or facilities.

The program manager seriously committed to the business model of educational management will first attempt to move these items into the direct cost category. Who benefits from the prestigious asset? Ph.D. students? Fine, charge it to the Ph.D. program. It contributes to student or faculty acquisition? Then allocate the expense in proportion to direct expenditures for these activities. The asset contributes to an image of expertise which improves the institution's chances of getting research contracts? Allocate the overhead to sponsored research.

In the event that none of these direct allocations are justified, it is reasonable to question the value of the "asset" whatever its prestige to the program or the institution.

Evaluation and Control

Program level evaluation and control is a relatively straightforward process providing the program manager has established explicit operating expectations, milestones, budgets, and performance quality criteria. Definition of operating expectations inevitably leads to "standard cost" questions, and the problems inherent in attempts to assess educational performance quality are legend. We will therefore comment on these two aspects of evaluation and control, and assume that the standard accounting procedures associated with budget control and the Gantt Chart or PPBS cost techniques used to evaluate progress toward specified milestones are reasonably well known.[1]

Specifying Operating Expectations

The problem of establishing explicit operating expectations for a course or other expense unit may be solved by adding two simple measures to those already included in the Professor Pre-Course Questionnaire.[2] The first is the budget, specifying the resources to be used by the unit. The second is the amount of faculty and staff time to be devoted to predefined activities (e.g. classroom interaction, preparation,

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[1] See for example Harry J. Hartley, Educational Planning-Programming-Budgeting: A Systems Approach, Prentice Hall, Englewood Cliffs, New Jersey, 1968.

[2] The Professor Pre-Course Questionnaire is reproduced in the Appendix.

individual consultation and grading. While it may appear that the first determines the second, development of meaningful standard costs requires both types of data. Time allocation measures also contribute to evaluation of the proficiency with which specific tasks are performed and detection of unusually efficient or inept performance.

The program administrator who maintains these data over time is in the position to establish increasingly accurate standard cost references for use in the resource allocation process. He will, for example, establish a range of normal time commitments associated with alternative teaching methods under different enrollments and have a basis for evaluating the marginal cost of a new instructor teaching a particular type of course as opposed to maintaining the previous year's faculty.

Generation of these expectation data insures that instructors and program management share a common and explicit definition of the task to be completed and the methods to be used. Post course comparison of comparable data generated after the fact with initial expectations gives the instructor useful feedback which may help him to become a more realistic planner and provides the program administrator with the information for tracking actual developments against plan.

Performance Assessment

Once measures of the type discussed in the preceding section have been defined and agreed upon, the program administrator must still overcome two obstacles to program evaluation and control. He must use the measures to determine the extent to which program objectives are being achieved and he must take action to reduce noted discrepancies between planned and realized developments. Application of requisite measurement procedures is insured if the program staff takes responsibility for questionnaire distribution and data collection. Achievement of program objectives is similarly insured if program management reallocates resources to alternative units when a group consistently fails to meet specified goals.

Both conditions are, however, dependent on program administration having the ability to obtain data from all courses and to allocate resources in a manner consistent with program goals. What if they do not? How does program management obtain expectations and performance data from a course if the faculty member in charge refuses to provide professor pre- or post-course evaluations, prohibits questionnaire distribution to his students, or directs those taking his course not to provide the requested information? What does program administration do if the faculty teaching a course rejects program objectives or refuses to modify demonstrably ineffective or

inefficient procedures? Such problems arose at M.I.T. and will arise in any organization in which goal setting, measurement and evaluation threaten existing relationships and practices.

In our opinion, such issues can only be resolved by giving those responsible for the program line authority to manage the program budget and allocate program specific resources to achieve program objectives. The organizational locus of this authority is irrelevant providing it is coincident with the responsibility for program planning, evaluation and control. Delegation of any one of these functions in the absence of the others lays the groundwork for mismanagement in depth. We will comment further on this thesis in the "organization issues" section of this chapter.

The proposed approach to performance assessment has a strong financial bias. It assumes that goal achievement must be closely linked to resource commitment and utilization. It also implies that educational programs cannot survive if they are burdened with nonproductive facilities and personnel. Adoption of this perspective could create a situation where programs refuse to finance "important" facilities or personnel. This might happen because program managers fail to establish a sufficiently broad time perspective and sacrifice long term growth and viability in the interest of short term efficiency. If this happens policy level management should be able to

reestablish an appropriate time perspective within the context of the program's performance measures. It is more likely that the proposed approach will focus policy management's attention on resources that are not contributing to the institution's educational programs. It is then their responsibility to establish a raison d'etre for these facilities or individuals and to find an appropriate source of funding to maintain them. It is hoped that policy level management would avoid the temptation to "finance" these activities by increasing "miscellaneous general and administrative expenses."

Program Costs Revisited

The issues considered in this section may be summarized by reexamining the cost structure of an educational program from the viewpoint of an enterprising entrepreneur considering the viability of a business venture offering quality Master's level management education in Cambridge, Massachusetts.

Faculty Costs

We assume "full time," 35 hour per week faculty members. We recognize that they may spend time on research and consulting, but if they do we should be able to generate compensating revenues which will be used to replace lost time with additional personnel. Contemplating a salary range of between $12,000 - $24,000 (we wouldn't think of using Ph.D. students as instructors) we assume an average salary of $18,000 per year. Applying a 50%

overhead loading and giving each man a secretary at $6,000 per year shared with one other faculty member, we have direct costs of:

• Salary and benefits (average)	$ 18,000
• Secretarial support (½ 6,000)	3,000
• G&A (Office, Rent & Administration)	9,000
Total Cost per Average Faculty Member	$ 30,000 per year

Faculty Productivity

Assuming we give our faculty man two months vacation each year and expect him to work the equivalent of a nine to five day, we have:

- 43 weeks X 35 hours/week = 1,505 hours per year

Is this reasonable? Remember, if he does other things we will generate compensating revenues, hire others, etc. The two months off is not traditional, but the pay scale is more than competitive and this project is being considered at a time when Ph.D.'s are not exactly in a seller's market.

Cost Per Contact Hour

We recognize that our cost per student/faculty contact hour will be a function of the average class size and the amount of preparation time required for each contact hour. However, our resource cost is:

- Cost of Average Faculty Hour, $30,000/1,500 = $20.00

Taking account of different preparation to contact ratios, several average class sizes and four typical program lengths, we have the cost structure summarized in Table 14.3. The program lengths selected are based roughly on the M.I.T. Senior Executive Program at 250 contact hours over ten weeks, the Sloan School two year Master's Program at 1000 (64 weeks at 15 hours per week), and some intermediate values.

Table 14.3 Hypothetical Total Per Student Cost For Faculty Time ($000)

Prep/Cntct Ratio		1						2						3					
Avg Class Size		5.	10.	15.	20.	25.	30	5.	10.	15.	20.	25.	30	5.	10.	15.	20.	25.	30.
Cost per Hour*		8	4	3	2	2	1	12	6	4	3	2	2	16	8	5	4	3	3
Program Duration in Hours	250	2.	1.	.7	.5	.4	.3	3.	2.	1.	.8	.6	.5	4.	2.	1.	1.	.8	.7
	500	4.	2.	1.	1.	.8	.6	6.	3.	2.	2.	1.	1.	8.	4.	3.	2.	2.	1.
	750	6.	3.	2.	2.	1.	.9	9.	5.	3.	2.	2.	2.	12	6.	4.	3.	2.	2.
	1000	8.	4.	3.	2.	2.	1.	12.	6.	4.	3.	2.	2.	16.	8.	5.	4.	3.	3.

* Cost per student per hour in dollars not $000.

Classroom Facility Cost

Since we are interested in maintaining a very high quality image for our program, we acquire office and classroom space in a new, air conditioned building not on, but with a view of, the Charles River. Our cost for this space on a five year lease with a substantial allowance available for furnishing is $8.00 per square foot per year. (We are not assuming tax exempt status since we hope to make a profit. Thus, a healthy Cambridge tax rate is included in this rate.)

Despite the allowance offered by the building, we spend an additional $5,000 for each classroom providing us with carpeting, advanced audio-visuals and attractive modern seating and lighting. This we amortize over a five year depreciation schedule (straight line).

Allowing 600 square feet (20 X 30) for an average classroom, our total annual cost per classroom is:

- Annual Cost per 20 X 30 ft. Classroom $ 6,000
  - Rent @ 600 X $8.00 $4,800
  - Depreciation on furnishing 1,000

While the number of classrooms required is clearly a function of class size, scheduling, and the number of students enrolled, the per student cost of classroom space is a direct function of class size (assuming all students must be able to be in an average class at one time). This cost is summarized in Table 14.4.

Table 14.4 Hypothetical Annual Classroom Cost ($000)

Avg Class Size	. 5	. 10.	15.	20.	25:	30.
Total Students Enrolled in Program 50	60	30	24	18	12	12
Total Students Enrolled in Program 100	120	60	42	30	24	24
Total Students Enrolled in Program 150	180	90	60	48	36	30
Total Students Enrolled in Program 200	240	120	84	60	48	42
Annual Cost per Student	1.2	.6	.42	.30	.24	.21

Combined Direct Costs

Combined faculty and classroom costs for a 500 to 1000 contact hour program are summarized in Table 14.5. We have assumed the 1000 hour program covers a two year period.

Table 14.5 Hypothetical Total Per Student Direct Cost ($000)

Avg Class Size	5	10	15	20	25	30	5	10	15	20	25	30	5	10	15	20	25	30
Total Program Duration 500	5	3	2	1	1	1	7	4	2	2	1	1	9	1	3	2	2	2
1000	9	5	3	2	2	2	13	7	4	3	3	2	17	8	6	4	4	3

We still have to consider the costs of marketing, course development, library facilities, computer support and classroom materials and other incidentals not paid for by students. However, we have begun to get some feeling for the sensitivity of costs-to-class size and, perhaps more important, our use of investment in faculty preparation time. We have also begun to establish a framework within which to examine what the student should pay in relation to alternative product offerings. And the costs are surprisingly low in relation to the actual figures developed in Table 14.2. (The average class size at the M.I.T. Sloan School is around 25 students while at the Harvard Business School classes average approximately 80 students.)

Faculty Selection

Our discussion of program structuring emphasized the critical role of the faculty in determining the success of program management efforts to achieve specified learning outcome objectives through courses based on selected learning processes. The need for faculty who are committed to program objectives and strongly motivated to work to achieve them should be self evident.

Without the full support of capable faculty members

> "...the fancy program will exist only on paper, while pretty much the same old tired thing goes on in the classrooms. In other words, if...programs are to achieve their laudable objective, the instructors must indeed be different in that they must themselves be broadly educated, dedicated to the integrative principles underlying the program, and (dare I say it?) effective teachers."[1]

The faculty member is the program's ultimate point of contact with its participants. In this sense, one might be tempted to view the faculty as a program resource, or as the operating management responsible for achieving the objectives established for the program. However, in most institutions and certainly at M.I.T., references to the line management model are totally inappropriate. Nothing will be accomplished until the program manager is able to gain the direct and personal support of individual faculty members responsible for the courses that make up the program curriculum. It is pointless to consider further steps in program planning...

> ...until some change is effected in the attitudes and values of those who make the system work -- the faculties. Little differentiation of function and no

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[1] Lean, op.cit., page 57.

> significant change in curricula can occur without at least tacit faculty support. And critical to an examination of their susceptibility to change are rewards and tenure.
>
> It cannot be doubted that faculty members as individuals want what is best for higher education, but neither can it be denied that little within the system suggests much pressure for change. In most disciplines, higher education in recent years has been a seller's market. Faculty salaries have risen, although not uniformly at all institutions. Federal research funds have provided additional inputs, and reductions have been made in teaching hours. Improved economic conditions in the profession caused one university president to observe recently that if faculty salaries 'continue to rise, we will be increasingly subsidizing a strange kind of leisure class.'[1]

We will comment on the tenure issue later in this section. However, before proceeding it may be useful to note that the "seller's market" condition no longer exists. Demand for faculty members has leveled off or is decreasing and by 1975 a "buyer's market" should be well established as illustrated in Figure 14.3.[2]

Whether this change in market state will have any effect on existing and tenured faculty remains to be seen. It does however seem reasonable to assume that the program manager, granted the necessary resource control to seek faculty members to staff his program, should be able to choose instructors from an increasing number of highly qualified prospective faculty members.

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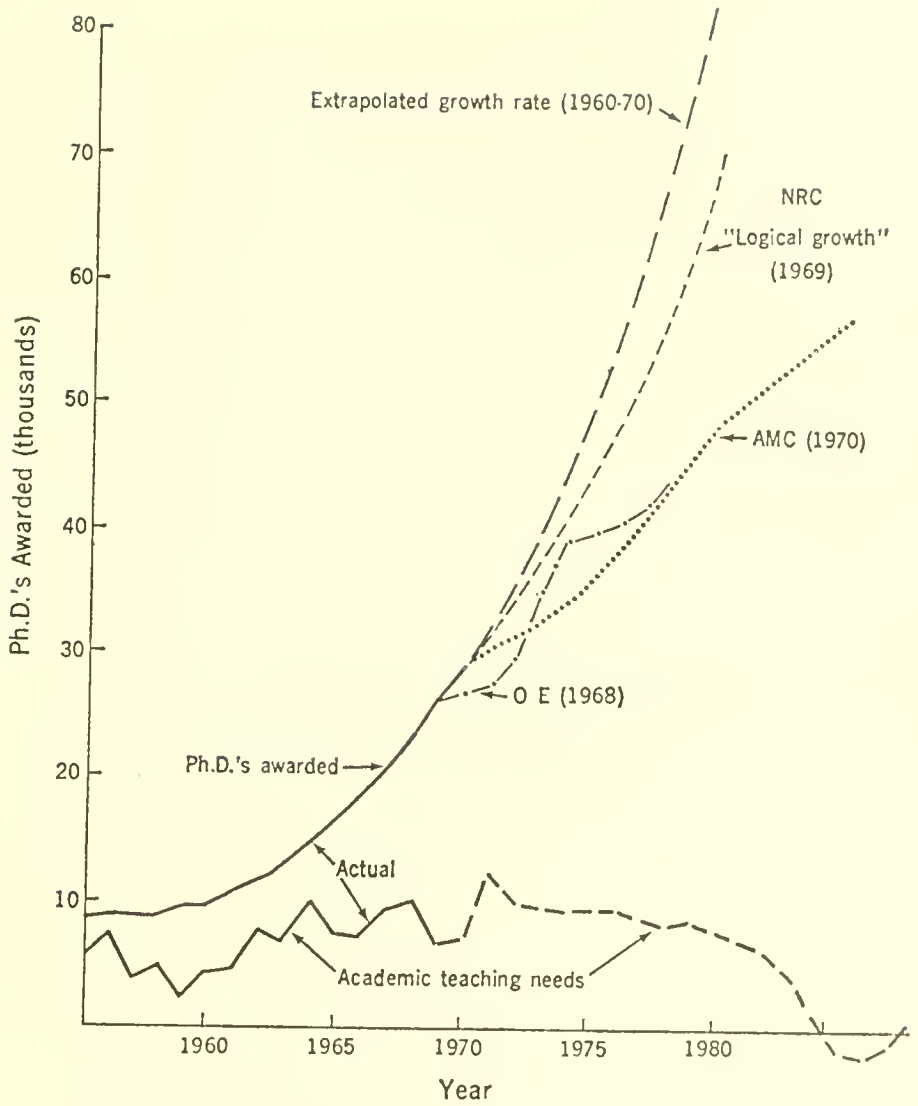
[1] Dungan, op.cit., page 149.

[2] Cartter, op.cit., pages 132-140.



Actual and projected Ph.D.'s awarded, and the number needed for college and university teaching. Included are National Research Council (NRC), Office of Education (OE), and the author's (AMC) projections.

Figure 14.3 "Buyer's Market" as Portrayed by A.M. Cartter

Selection Criteria

What criteria should the administrator use when selecting the faculty for his program? Our previous comments regarding the forthcoming supply of Ph.D.'s have already indicated a natural bias toward those who have achieved a certain level of academic accreditation. Given the orientation of those responsible for accreditation and the general population's continued respect for advanced degrees, this criterion is probably pragmatically justified. Unfortunately, there is no evidence to suggest that this credential requirement will have any substantive impact on the applicant's qualifications to teach in the program.

> If credentials place the professional stamp of approval on qualities that were important to the higher educational process, we would be delighted with them. The problem with credentials,... is not that they exist, but that they are irrelevant in too many cases.[1]

The irrelevance of credentials is primarily attributable to the absence of significant preparation for teaching in most doctoral curricula. The typical Ph.D. is devoid of experience in, preparation for, or concern with teaching.

> ...(The)...reason for substandard teaching simply is that college professors don't know how to teach. Aside from a microscopic number who have had some experience in grade or high schools (where formal teacher training is required), nobody on the typical campus has ever had a lesson in learning theory, lecturing techniques, or organization of material for classroom presentation.[2]

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[1] Dungan, op.cit.page 148.

[2] John Fisher as quoted by Lean, op.cit., page 13.

The second and most important criteria should be the applicant's interest in and commitment to teaching. "Why of course," those unfamiliar with the professorial profession may say, "He's hiring people to teach in his program, so he will want to select good teachers." Unfortunately, this apparently reasonable response reveals a simplistic and inaccurate perception of the intricately involuted faculty selection process.

> (Selection)...actually depends primarily upon books and articles published, papers read at scholarly conferences, and research grants. What matter if the publications are ineffably trivial in their significance, if the speeches are so specialized and dull that they put even their sophisticated audiences to sleep, if the research grants predictably produce nothing of consequence? That's the way the academic ball bounces!
>
> When administrators in higher institutions recruit new faculty members, they almost never betray the slightest interest in the teaching ability of the prospect, but they pay great attention to his list of publications.[1]

The implications of non-commitment to program objectives go far beyond the effect, however critical, on motivation to teach.

> ...we are steadily recruiting people to college and university faculties who are deeply hostile to the central values and functions of the department and institution they join. We see them increasingly at scholarly conventions and as supporters or leaders of student demonstrations. We are beginning to see them in growing numbers on departmental and university committees, where the old assumptions regarding the shared unspoken values of academic men, cutting across disciplinary lines, can no longer be sustained. And where these shared values are no longer shared, whether because of political students or dissident faculty, the old forms of uni-

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[1] Lean, ibid.,page 16.

> versity government by discussion and consensus begin to break down. The consequence is the steady politicization of government at every level and in every arena, attended by the withdrawal of men whose sense of obligation to university service does not extend to polemical politics."[1]

The third criteria should be knowledge and competence in an area of inquiry compatible with the central program focus. This does not mean that a program in management will hire only accountants and labor relations specialists. The objectives established for the Sloan School program called for faculty members with a broad range of interests and orientations. In fact, the most difficult positions to fill were those associated with the "Policy" and "Managerial Environment" courses noted earlier -- positions requiring faculty members capable of having an impact on the less functionally specific learning outcome dimensions (e.g., attitudes toward profession and career objectives, skill in conceptualization, communication, and inducing change).

Finally, we would impose an experience requirement and hopefully one that would go beyond the "good businessman" qualification described earlier in this chapter. In a school of management, this criterion is crucial if we are to acquire faculty members capable of providing realistic knowledge of the management environment, meaningful attitudes toward the practice of management, and skill in inducing change under realistic organizational constraints.

It may be unreasonable to expect all faculty members to have actual experience in applying the knowledge and skills to which their credentials

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[1] Trow, op.cit., page 30.

attest. It may be even undesirable to employ only instructors whose attitudes have been tested in the "real world." However, some (and we would argue a substantial) portion of the faculty must meet this experience requirement if the program is to have the validity and relevance justly demanded by today's students.

Some may be puzzled by the absence of "a scholarly orientation" from our list of criteria. This exclusion is premeditated and purposeful. We have opted for an involved and committed teacher in lieu of an erudite pedant. The connotations of the word, "scholar," in the academic community are antithetic to the traits of an effective, contributing member of a teaching faculty.

The Selection Process

The first point to be noted in examining the faculty selection process is that the faculty, rather than the program (or school) administrator, most often controls the evaluation process through which new faculty members are chosen. We have discussed alternative criteria as if the program manager were in a position to specify and apply them. In the traditional university structure, this is seldom the case. A new faculty member is expected to join one or more of the existing disciplines or functionally oriented faculty groups. As such, it is only reasonable that current members of these groups evaluate the prospect's qualifications for entry into their private club. The program manager whose objective is to acquire a faculty with a strong commitment to teaching may be faced with the unpleasant (if possible) task of breaking this ingeminative cycle.

In our opinion, the program manager must insure that the selection process implements the selection criteria he has established. And, the most difficult criteria to apply and validate are those associated with the prospective faculty members commitment to and capability in teaching.

There is no easily measured surrogate for competence as a teacher and the simple reality is that, while talented applicants for faculty positions may point to all manner of prior accomplishment and contribution, it is highly unlikely that they are really teachers.

> (They may be)... mathematicians, physicists, historians, linguists, etc., -- not teachers. Many of them are men (and women) of great stature; major contributors to science, technology, and the arts; but they are not teachers. On some scales of worth to humanity they outweigh the teachers; but they are not teachers. They might even be indispensable to institutions of higher learning; but they are not teachers. To them, students are means; to teachers, students are the end products; -- all else is a means.[1]

The traditional faculty selection process generally focuses on the applicant's "scholarship" -- his technical expertise in a selected area of specialization. On rare occasions he may be called upon to "present" his current research activities to a faculty or graduate seminar. His performance in this test is most apt to be graded by the esotericism of his arguments, the complexity of his logic, or the obscurity of the references on which his work is based. At M.I.T., the faculty has come to regard the use of elaborate mathematical notation (preferably in Greek symbols) as an important indication of pedagogic prowess.

Many of these issues have been unusually well stated by Kenneth Eble,

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[1] Joseph Seidlin, as quoted by Lean, op.cit., page 13.

> "... teaching may suffer most from being the one thing almost everyone in the academic profession is expected to do. Teaching at its best is a great art, and great art of any kind is rare. Engaged in as a mass enterprise, for faculty as for students, teaching has difficulty rising above a kind of middle level that hits the students somewhat above where they sit down and well below where they think.
>
> ..., teaching, for all its endless verbalizing, is a silent, secret art. Today's doctor of philosophy has a very private practice, enclosed by the specialized courses he can call his own and protected by academic traditions and superstitions. Among these are beliefs that the Ph.D. is a license to teach; that scholarly assiduity ensures good teaching or makes up for bad; that the popular teacher can't be profound and the profound one popular; that teaching can't be taught; and that, however deficient a professor may appear, he will turn out to be, for some students, some time, a superior teacher."[1]

The Course Evaluation Questionnaire developed in our research has been shown to be a reasonably effective instrument for assessing the learning outcome impact of classroom interaction. We would therefore propose that this instrument or an equivalent measurement technique be applied to test the ability of prospective faculty members to achieve previously agreed upon learning outcome objectives in a classroom presentation. In short, we would propose that "auditions" become a standard part of the selection process. In this way, the program administrator and existing program faculty would have an opportunity to observe and measure the prospect's effectiveness in performing the task for which he is to be hired. Undoubtedly, some applicants would be horrified at this "totally unprofessional" approach and quickly depart

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[1] Kenneth Eble, The Recognition and Evaluation of Teaching, American Association of University Professors, Washington, D.C. November, 1971, pages 2-3.

in an indignant huff. On the basis of the limited evidence gained to date, we believe that the prospective faculty member seriously committed to a career in teaching will react most positively to this opportunity to demonstrate his skill in an area to which he attaches great importance, and will be impressed by the program's concern for this oft neglected facet of his chosen profession.

Review and Evaluation Procedures

There is little point in extending effort to develop and apply selection criteria when acquiring faculty members, if these criteria are immediately forgotten once the instructor becomes a member of the program faculty. Competence and commitment to teaching may be a primary element in the selection criteria. But what happens once the metamorphosis from prospect to faculty member has been completed? The fundamental problem within most universities was succinctly summarized by David Riesman and Christopher Jencks in The Academic Revolution.

> There is no guild within which successful teaching leads to greater prestige and influence than mediocre teaching... No doubt most professors prefer it when their courses are popular...but since such successes are of no help in getting a salary increase, moving to a more prestigious campus, or winning their colleagues' admiration, they are unlikely to struggle as hard to create them as to do other things.[1]

The challenge is to maintain the priority system underlying the choice of selection criteria. In the case of an educational program, this means the maintenance of an emphasis on teaching. Unfortunately,

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[1] D. Riesman and C. Jencks, The Academic Revolution, Doubleday, Garden City, New York, 1968.

the realities of academic life are such that the program administrator intent upon emphasizing teaching may be forced to spend a substantial portion of this time de-emphasizing the many "professional" activities to which the faculty member might otherwise allocate the program's most valuable resource -- his time. In most universities, the young faculty member faces all but insurmountable pressures to do everything but teach -- pressures

> "... which make it impossible for aspiring faculty to spend adequate time either with students or preparing for classes; a general de-emphasis on teaching which convinces younger faculty that this is not an important goal; the screening out of those who demonstrated a high capacity for teaching, but who do not measure up because such talents are not considered significant; and the willingness of those in power to overlook bad teaching when it appears."[1]

The administrator's challenge is to create an environment in which new faculty members will be motivated to produce exceptional teaching performance. At M.I.T., the "Salgo Award" was established for this purpose.

TO THE STUDENTS AND FACULTY OF THE
ALFRED P. SLOAN SCHOOL OF MANAGEMENT

> The Salgo Award Committee invites, from the faculty and the 1971-72 student body of the Sloan School, nominations for the Salgo Award for the academic year 1971-72. That award of $1,500 was established by the Salgo-Noren Foundation in order to extend recognition for excellence in teaching. We would be very grateful if you would, on the enclosed sheet, indicate your first and second choices for the award, and return the sheet to me as soon as possible. It would be most valuable if you would, either in the space provided, or on a separate enclosure, furnish comments indicating in what respect you found the nominee's teaching particularly valuable. Be as terse or as detailed as you like, but do give us the benefit of your view of who deserves the award, and why.
>
> (Full Professors are not eligible for the award; nor are Associate Professors)[2]

[1] Dungan, op.cit., page 148.

[2] Salgo Award Competition Announcement circulated by the Salgo Award Competition in April, 1972.

On the basis of the wording of this announcement and the magnitude of the compensation awarded the winner, one might assume that the Sloan School has established a firm commitment to excellence in teaching and that attendant attitudes and values would be strongly inculcated in the faculty. But, alas, "One swallow maketh not summer."

The Salgo Award was first presented in 1968. As of this writing it had been received by four faculty members whose contribution to "excellence in teaching" segregated them from their less committed colleagues. Unfortunately, recognized excellence in teaching is not the only characteristic which differentiates these individuals from other faculty members at the Sloan School. As a result of negative promotion decisions or subtler behind the scenes indications that "other campuses might offer greater opportunities," only one of the previous Salgo Award recipients currently has full faculty status (i.e., Instructor; Assistant, Associate or Full Professor) at the M.I.T. Sloan School of Management. As William Arrowsmith remarked to the annual meeting of the American Council on Education in 1966:

> "... the universities are as uncongenial to teaching as the Mojave Desert to a clutch of Druid priests. If you want to restore a Druid priesthood, you cannot do it by offering prizes for Druid-of-the-year. If you want Druids, you must grow forests."[1]

---

[1] William Arrowsmith as quoted by Kenneth Eble, op.cit., page 1.

It is impossible to consider the issue of faculty performance review and evaluation without commenting on the most effective catalyst for complacency and inaction created by modern man -- academia's unique form of professional civil service -- tenure.

> There is no doubt that academic tenure still plays an important role in insuring basic academic freedom. But by the same token it has -- without any reference to academic freedom -- assumed an equally or more important function as a guarantee of job security. It is this latter aspect of tenure that deserves re-examination. We need to devise alternatives to the existing tenure system that will continue to protect academic freedom and introduce more competition thereby insuring continued vitality and productivity in the system.
>
> Unless the present system of compensation and tenure is altered, pressures will continue to convert all colleges into universities, for it is research that is rewarded regardless of its quality or relevance. Similarly, the pressures within the present system -- reinforced by bureaucratization, numbers, and trade union egalitarianism -- will eventually price the academic out of the market or reduce the bulk of the profession to a relatively low level of uniformity. And of overriding importance is the threat that the present rigid system poses to real innovation in curriculum and modes of instruction and to the continued existence of the university as a dynamic institution.[1]

Some universities are currently considering the elimination of tenure. However, the fear and paranoia permeating these deliberations are sufficient to preclude access to written minutes or "on the record" comment by faculty or administration. Viewing the emotion attendant to these discussions, we can only repeat the question posed by Ralph Dungan

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[1] Dungan, op.cit., page 151.

> How realistic is it to suppose that the university has within itself the capacity to examine itself systematically and rigorously and to make, in a timely manner, those adaptations that are reasonable and necessary.[1]

Student Selection

Program management issues associated with student selection can be roughly divided into two categories: program promotion and admissions procedures. Since these topics were treated rather extensively in Chapters 7 and 13, we will limit our comments in this section to observations drawn from the M.I.T. experience which have not been noted in earlier discussions.

Program Promotion

While our review of financial issues did not deal explicitly with the cost of program promotion, expenditures for production and distribution of a multitude of brochures, catalogues, and flyers as well as the cost of faculty and administration recruiting efforts are significant.

The M.I.T. experience suggests that the program administrator might profitably emphasize three aspects of program promotion activity. These are: (1) the definition of target audiences, (2) choice of media, and (3) communication content specification.

Target Audience Definition

The experience of the Master's Program Committee at the Sloan School added two dimensions to the target audience descriptors referenced in earlier chapters: concern for social issues and minority group membership. The first characteristic became relevant as a result of increasing

[1] Dungan, ibid., page 151.

faculty interest in expanding the scope of courses beyond the traditional areas of managerial concern to include the management of cities, government agencies, health facilities, and other civic and public service organizations. M.I.T.'s interest in recruiting qualified minority group members produced sensitivity to selected population segments.

Media Selection

The new emphasis placed on establishing a broader audience definition for the Sloan School's recruiting activities motivated a re-evaluation of personal faculty contact as a communication medium. The following is an excerpt from the Master's Program Committee discussion of this question.

> The efficiency and communication value of personal faculty visits was discussed. The conclusion was that faculty members tend to have very narrow views of life at Sloan and may provide a rather uneven picture of programs and activities with which they are not directly concerned. Therefore the practice of individual visits should be dropped and new communication mechanisms sought. Suggestions included conferences for undergraduates, meetings with counselors, and team presentations to carefully selected groups contacted in advance and perhaps invited to Cambridge. Inclusion of current students in such teams was also proposed.[1]

The Sloan School's interest in encouraging applications from adequately prepared minority group members reflected a broader M.I.T. concern. Taking a direct approach to the communication problem, M.I.T. experimented with the use of special interest media to reach potential minority applicants. The advertisement, reproduced in Figure 14.4 appeared in the June 1971 issue of Ebony. While data generated by the admissions office did not support quantitative evaluation of the

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[1] Excerpt from minutes of the April 1971 Master's Program Committee Meeting.

If You're A Junior Thinking About College

MIT May Be For You!

The young men and women who come to MIT don't do so by chance. They worked and planned for it and so should you.

An MIT education is learning how to use the skills of scientific investigation and problem solving in a variety of areas: political science, pre-medicine, economics, architecture, management, pre-law, urban studies, and the humanities as well as our traditional fields of engineering and science.

The hard work at MIT is for a purpose; besides developing and preparing the mind for tomorrow's leadership, it offers young people a foundation on which to understand and deal constructively with our complex society. MIT students are involved in many cultural, social, and athletic activities.

To prepare for MIT your high school courses should include a year of physics, chemistry, and math at least through trigonometry. By taking the College Boards in May or July, you will know where you stand when you talk with colleges about your admission chances during the Fall. We require three Achievement exams: English or American history, math level I or II, and physics or chemistry. (Plan to take the science Achievements as soon as you've finished the course while the material is fresh in your mind.) You can always retake the exam—we only consider the highest score. Remember fee waivers are available for needy students—see your counselor. Financial assistance is available for accepted American undergraduates who are in need of such assistance.

If you've prepared yourself well in high school, we can offer you some beneficial ways of making use of an MIT education.
To Prospective Graduate Students:

At the graduate level the admission requirements, financial aid policies and curricular vary from one department to another. It is therefore up to you to write well in advance for information concerning your particular field of interest. In this way you can structure your senior year program to coincide with the necessary graduate school requirements. Above all, strive for academic excellence.

Massachusetts Institute of Technology

Undergraduate Information:
Roland B. Greeley
Director of Admissions
Room 10-100

77 Massachusetts Ave.
Cambridge
Massachusetts 02139

Graduate Information
Irwin W. Sizer
Dean of the
Graduate School
Room 3-140

Figure 14.4 Advertisement from Ebony

effectiveness of his promotion, ("there is no way to measure the effect, you know") the general impression is that the ad may have had a positive effect on the intended audience. However the ad will be discontinued in the future due to the lack of substantive evidence to "justify the expense".

Communication Content Evaluation

As a result of research findings regarding the impact of formal communication, the Master's Program Committee became concerned with the program description presented in the school catalogue and program brochures. Evaluation of the content of existing M.I.T. literature, in comparison with that distributed by other graduate schools of business, led to the conclusion that new brochures describing program goals, content and approach should be designed to provide a "... broader and more persuasive communication rather than simply presenting the 'facts' of course content, faculty degrees, etc." Communication of a "sense of excitement," of participation in "something relevant" was established as the objective for the rewrite effort.

The Master's Program Committee considered including an explicit description of intended admissions criteria in their program brochure. However, complex legal considerations, in combination with faculty concern over how aggressive applicants might develop "a Supreme Court case" based on such material if they were not admitted, led to the defeat of this proposal.

Admissions Process

The Chapter 7 discussion of admissions procedures included a detailed examination of experiences at the Sloan School during the last decade.

There are, however, three areas of program management activity which warrant brief additional comment. These are the use of quotas, integration of quantitative and qualitative admissions criteria, and factors affecting the choice of a particular procedure.

Quotas

The Sloan School's admission objective has generally been to establish a balanced and heterogeneous Master's Program student body. It is not surprising therefore that those concerned with admissions procedures have frequently debated the merits of stratified selection with explicit quotas versus "random stratification."

Explicit quotas have been used in an attempt to achieve a reasonable balance between foreign and domestic students in each year's class. At first blush, this problem may appear relatively trivial. After all, there are only two categories, foreign and domestic, and the consistent objective has been to maintain a two to one ratio in favor of domestic students. This initial impression of relative simplicity is spoiled by the data covering the Committee's experiences during the last three years. Table 14.6 shows the number of domestic and foreign students admitted (Ad), accepted (Ac), and attending (At) from 1968 through 1971. This table also summarizes the acceptance/admission, attendance/acceptance, and attendance/admission ratios derived from the basic data.

The probabilistic gymnastics involved in attempting to maintain desired quotas are succinctly summarized in the following excerpt from the minutes of an early Spring Master's Program Committee meeting.

> We have admitted 226 domestic students (including Canadians) and 56 foreign students for a total of 282. Based on last year's acceptance rate, we would

Table 14.6 Sloan School Master's Program
Domestic and Foreign Student Admission Data
for 1968 through 1971.

	Numbers			Ratios		
	Ad	Ac	At	Ac/Ad	At/Ac	At/Ad
1968/69						
Domestic	207	88	66	43%	75%	32%
Foreign	56	37	30	66%	81%	53%
Total	263	125	96	48%	77%	37%
1969/70						
Domestic	230	119	95	52%	80%	41%
Foreign	60	43	33	72%	77%	55%
Total	290	162	128	56%	79%	44%
1970/71						
Domestic	186	91	80	49%	88%	43%
Foreign	63	28	20	44%	71%	31%
Total	249	119	100	48%	84%	40%

Ad: Admitted
Ac: Accepted
At: Attended

> expect to get approximately 97 domestics and 37 foreigns for a total of 134. In fact, the net acceptance is 146. However, last term 75% of the domestic students and 81% of the foreign students accepting actually showed up. This would yield, based on current acceptance rates, approximately 80 domestic students and 32 foreign for a net total of 112. Given the current contraction of the second year, this would yield precisely 200 students in the two years.
>
> Professor H.., noted that based on ratings given by the application readers the highest quality class would have been achieved by admitting 198 domestic and 84 foreign, rather than 226 domestic and 56 foreign.[1]

The final comment in this excerpt illustrates one of the great frustrations associated with the use of explicit quotas. Tradeoffs must be made between equally desirable objectives, and goals which are formalized in a quota system are more apt to be achieved than those which are left to chance.

The foreign/domestic quota system has been generally accepted by the faculty because of their favorable attitude toward maintaining a broad range of cultures and backgrounds in the student body. Its survival is also attributable to the fact that the quota does not visably favor any single faculty group or operate to the detriment of a particular function or discipline.

Other quota systems considered by the Committee have been received with less equanimity. Consider for example a proposal to establish quotas based on broad functional orientations as revealed in the student's intended concentration option. The data summarized in Table 14.7

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[1] Excerpted from the minutes of an April, 1971 Master's Program Committee Meeting.

Figure 14.7 Concentration Option Choices of Entering Master's Candidates

Field	1969	1970	1971
Finance	18	15	21
Industrial Dynamics	3	4	7
International Management	9	11	9
Industrial Relations	0	1	6
Management Information Systems	30	36	20
Marketing	7	11	8
Operations Management	3	5	9
Operations Research	6	7	3
Organizational Behavior	16	18	9
Other	1	1	0
Undecided	0	0	5

have been used to support arguments on many sides of this issue. For the faculty member interested in promoting functional heterogeneity, they indicate a strong bias toward certain options. For the program administrator interested in allocating resources in response to customer demand, they suggest that program-based funding for certain areas might be reduced or eliminated. For functional groups experiencing a decrease in student's electing their field of concentration, these same figures document a "diabolical conspiracy" on the part of admission committee members.

The situation is further complicated by the recognition that stated student intentions are not a totally reliable indicators of student actions. Table 14.8 documents the "switches" that occured after students had spent four months in the Master's program.

In the absence of both faculty agreement regarding a desirable quota structure and reliable measures of ultimate student option election, the committee has, thus far, left determination of the concentration option mix to "fate". The earlier discussions of institutional image summarized our belief that the current M.I.T. image is strongly biased toward Management Information and Control Systems. If this is the case, the resulting concentration option distribution is more appropriately viewed as a product of natural selection.

Qualitative versus Quantitative Criteria

As noted earlier the Master's Program Committee established explicit criteria which were to be used when evaluating applicants for the Sloan School program. These were communicated to all applicant readers as part of a "program objective" statement developed by the committee.

Table 14.8 Change in Student Option Selection After One Term

Fall Option Intentions	End of Semester Option Intentions (1968)														
	FIN.	IND.DYN.	INT.MGT.	MIC	MIS	MKT.	OSG.	OP.MGT./OR.	IND.REL.	BUS.POL.	POL.ECON.	MGR.ECON.	No Response	TOTAL	Percentage+
FIN.	1				2	1	1						2	7	14
IND.DYN.		1		1										2	50
INT.MGT.	3		6		1			1						11	55
MIC	2				3									5	0
MIS					9		2							11	82
MKT.	1					3								4	75
OSG.			1				3	1						5	60
OP.MGT./OR.	3	1			3	1	3	7						18	39
IND.REL.	1				1		1							3	0
BUS.POL.	1			1	1		1							4	0
POL.ECON.					2									2	0
MGR.ECON.							1							1	0
No Response	3	1	1	1	4	1							1	12	
TOTAL	15	3	8	3	26	6	12	9					3	85	

+Percentage of students who select same option after one semester's exposure.

Key to Option Titles

FIN.	Finance	OP.MGT./OR.	Operations Management/ Operations Research
IND.DYN.	Industrial Dynamics	IND.REL.	Industrial Relations
INT.MGT.	International Management	BUS.POL.	Business Policy
MIC	Management Information & Control	POL.ECON.	Political Economics
MIS	Management Information Systems	MGR.ECON.	Managerial Economics
MKT.	Marketing		
OSG.	Organizational Development		

> The Sloan School Master's Program will prepare students to function effectively as professional managers in public or private organizations.
>
> In selecting participants for this program, the faculty will emphasize:
>
> - willingness to attack complex situations
> - academic performance and aptitude as measured by ATGSB
> - creativity
> - experience in non-academic organizations
> - leadership potential
> - math background and proficiency
> - motivation for the study of management
> - seriousness of interest in the apparent commitment to the Master's Program
> - quality of Plan

Despite general agreement among committee members and application readers, one consideration continued to plague those involved in the admissions process. How could we achieve effective trade-offs between the explicit and quantitative criteria (e.g., academic performance and ATGSB aptitude) and the equally important but qualitative traits (e.g., leadership potential and seriousness of interest)? This concern increased after the research findings reported in Chapter 7 verified what many committee members had suspected -- that applicant evaluations were biased toward the quantitative and thus more easily assessed measures. The continued ambiguity of this situation and attendant ambivalence are revealed in the following curt comments on "application review procedures" reproduced in their entirety from the minutes of the final Program Committee meeting in the spring of 1969.

> After reviewing Professor H...'s report on the experimental elimination of test scores from data provided application readers, the committee

> voted unanimously to eliminate the test scores from the information provided application readers in the coming year.
>
> A two year experience requirement was proposed by Professor A... . While marginally supporting some bias favoring experienced candidates, the committee voted to postpone implementation of any experience based admissions requirement until they had had an opportunity to evaluate the effect of a proposed experimental applied management program.
>
> Several committee members expressed concern regarding applicant "ability to communicate in the English language". The possibility of including "an essay" as part of the required application material was discussed; however, no definitive action was proposed.
>
> Professor A... noted research findings indicating a high variance in the criteria used by specific application readers during the preceeding spring. After a brief discussion of the nature of noted inconsistencies, the committee concluded that it was inappropriate to attempt to impose consistent criteria for use by all readers reviewing applications at this time.

Procedural Issues

The historical development, summarized in Chapter 7, traces much of the Master's Program Committee thinking with regard to the procedural aspect of admissions processing. The status of Master's Program Committee thinking at the conclusion of the data acquisition phase of this study in June 1970 is summarized in the following excerpt from their June 12 meeting.

> Four alternative admission procedures were discussed and evaluated.
>
> . Reader (faculty) evaluation using an Accept-Neutral-Reject (A-N-R) rating system
> . Reader (faculty) evaluation using a Neutral-Reject (N-R) rating
> . Staff (non-faculty) evaluation using:
> - subjective evaluation as at present
> - thresholds with explicit weightings subjectively provided

- explicit weightings provided by objective measurement
. Random selection with an ATGSB cutoff

Voting on these four alternatives yielded the following results.

- Faculty reader with A-N-R	14 yes,	0 no
- Faculty reader with N-R	withdrawn	
- Non-Faculty reader with		
- subjective criteria as now	4 yes,	10 no
- explicit weights on subjective criteria	10 yes,	4 no
- explicit weights on objective criteria	4 yes,	10 no
- Random selection with ATGSB cutoff	3 yes,	11 no

The Master's Program Committee was also interested in increasing alumni participation in the admissions process. This desire was motivated in part by the belief that the Committee should attempt to increase alumni inputs to all aspects of program management, particularly admissions, goal setting, and program evaluation. It also reflected a realization that other colleges in the area were devoting substantial resources to obtaining increased alumni support for admissions. Harvard, for example, was reported to have established a program involving approximately 2500 alumni organized into 100 regional groups under the direction of area coordinators. These regional units were asked to identify promising candidates, coordinate Harvard admissions staff visits to the local area, and perform preliminary interviewing and screening functions.

Action to establish a similar organization to support the Master's Program was discouraged on the assumption that alumni impact would be minimal once a student had left his local area to attend an undergraduate college. This type of organization was, however, considered to offer substantial potential to support undergraduate recruitment <u>providing</u>

alumni could be made aware of and effectively communicate changing program objectives and methods.

Student and Faculty Orientation

Traditional orientation programs at M.I.T. as well as other universities are designed to familiarize entering students with the courses, facilities, faculty and administration of the program they are about to enter. In the three years during which this research was conducted, the Sloan School Master's Program Committee experienced a significant shift away from this traditional view.

This changed perspective, which resulted in changed objectives for the orientation program and new orientation activities, was largely attributable to the work of the Sloan School Organization Development Group and in particular, to two professors from the Organization Studies area, Edgar H. Schein and Irwin M. Rubin, who served on the Committee during the transition period.

Traditional and Alternative Orientation Programs

The traditional university orientation program is often organized around a series of speeches, followed by question and answer sessions, a sherry hour and/or dinner. During this program, students are exposed to members of the program faculty and administration who extoll the virtues of the institution, the breadth and content of program courses, the brilliance and diversity of program faculty, the wit and concern of program administration, the quality of program facilities, and the uniqueness of program participants. There is, unfortunately, a growing body of evidence to suggest that this traditional approach has not worked. Observers of the university scene have commented frequently on

".. failure of graduate departments to socialize their students effectively or to gain from them a commitment to their purpose and values and conceptions of the discipline and the university."[1]

Our research had provided ample evidence that the expectations of entering students were at variance with those of the faculty. However, it was not clear that traditional orientation programs provided the mechanisms required to resolve this confusion.

> The traditional 'orientation' program, because of its structure and the way it is implemented, only adds to the entering student's feeling of powerlessness, confusion, and anxiety. The student is 'told', 'lectured at,' 'described to' -- he is oriented. The very definition of this word (see any dictionary) reinforces the one-way nature of the process. Even if the student is given the opportunity to ask meaningful questions, he will be reluctant to do so. This is understandable against the background of ... his educational socialization. He has been taught and rewarded for being a passive recipient of <u>teaching</u> rather than an active participant in his own <u>learning</u>[2]

The program manager faced with this less than encouraging state of affairs may adopt one of three approaches to orientation.

- He may devote substantial resources to the development of an effective orientation program.
- He may limit orientation activities to a welcoming dinner or other social function.
- He may eliminate formal orientation all together and get on with the business of registration and classes.

The Sloan School Master's Program Committee chose the first option

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[1] Trow, <u>op.cit.</u>, page 30.

[2] Irwin Rubin, <u>et al.</u> "The Process of Joining Up Individuals and Organizations", <u>Educational Opportunity Forum</u>, Vol. 1, Number IV, Fall, 1969.

believing that an effective orientation (or, as they came to call it, "organizational socialization") process could contribute markedly to the effectiveness of future program activities.

The Objectives of Orientation

Initial discussions of the orientation process suggested the three objectives noted previously in Chapter 4. First, the program should provide factual information regarding the content and format of the educational program. Recognizing the existence of student expectations that were at variance with those of the faculty, the Committee believed that a positive presentation of program goals and methods would bring student expectations into line with reality. By providing "the facts" they also hoped to resolve uncertainties about the program and thereby remove student anxiety that might hinder positive participation in future educational activities. The second objective was to present a positive overview of the school and the M.I.T. environment, thereby reinforcing the student's decision to enter the program. Finally, the Master's Program Committee wished to generate faculty-student and student-student interaction in the hope that entering students would establish personal relationships with the program faculty and other participants.

During these discussions, Committee members associated with the Organization Development Group suggested that the Committee should be concerned with two classes of decision that the entering student must make if he is to become a productive member of the program community. These were (1) a decision to join the community and (2) a decision to

participate in the program.

On the basis of experiences in an experimental program conducted at the Broad Meadows Junior High School in Quincy, Massachusetts in the Fall of 1968, members of the "OD" group suggested that the overall objective of orientation should be to help the student "join up with the system" in a way which would enable him to make and maintain a strong commitment to the program.

> The Broad Meadows ... sessions were called 'Tune-In-Time.' The faculty, staff, students, and numerous resource people from the community arranged small group meetings to discuss such questions as 'Who is in charge of learning?' 'What do you want to learn?' and 'What is important to learn?' A new climate was established in the school as a result of this process of forming the psychological contract. Students feel that the faculty is interested in them as real people. Interestingly enough, the most observable changes are in the teachers. They feel less stuck in their previous, narrowly defined, role relationships.[1]

Discussion of this and comparable programs caused the Committee to reformulate its objectives for orientation. The initial goal of presenting a positive view of the program and institution was modified as a result of the retrospectively obvious realization that a biased presentation might simply create additional incongruities which would have to be resolved through later experiences. The new objective was to provide a balanced representation which would enable the entering student to achieve a valid and realistic concept of life at the Sloan School

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[1] Ibid., page 62.

and M.I.T., gaining satisfaction from its strengths and advantages while accepting its weaknesses and problems. It was also suggested that the program should be organized so that small informal student groups could examine the feelings and emotions underlying his approach to the program, its faculty and other students.

This approach to orientation was later described by members of the Organization Development Group with enthusiasm (and a certain positive bias) as follows.

> We have two specific goals. First, we will help the entering student develop an accurate and realistic 'cognitive map' of M.I.T. as a system, its strengths, weaknesses, resources. (Students) ... in groups ... (will be encouraged) ... to confront advisors, members of the faculty and administration, and other students. We do not expect that all questions can be or will be answered. This is not crucial. What is crucial is that the process of asking questions and of proactively seeking answers to issues of real concern be legitimized from the start. Second, in small groups we will help each student develop an accurate, realistic 'emotional map' of himself as an individual. Within the format of the small, unstructured group, each student will attempt to develop a better understanding of:
>
> i. his own expectations of M.I.T., of himself, and his reasons for coming;
>
> ii. the factors which operate to lower a person's commitment and motivation and ways of coping with these blocks;
>
> iii. and, the mechanisms by which a person can set personally relevant learning and career goals and ways of moving toward achievement of these goals.
>
> Clearly, the process of setting up a psychological contract or joining up as we conceive it (in contrast with traditional orientation programs) is a two-way, two-sided process. The students represent only one party in the contract.

> For this reason, one crucial element in our experimental program is the full participation in the student groups of faculty members who are to assume advisory roles during the coming year. Faculty and students <u>together</u> will develop cognitive maps of M.I.T. as a system. <u>Together</u> they will develop the warmth, openness, and trust which are necessary to insure effective levels of emotional and psychological support. By investing substantial energy at the point of entry, a collaborative process can be initiated between students and the system they are joining.[1]

It should also be noted that one of the most successful and universally acclaimed orientation activities was informal suppers organized by the Master's Program Committee but arranged by individual faculty members. These small informal gatherings of three or four graduate students (and their wives) with a faculty couple, formed associations which continued throughout the student's two years in the Master's Program and beyond.

<u>Measuring the Impact of Orientation</u>

As noted in Chapter 4, attempts to assess orientation programs are complicated by the very short time period over which change must be measured. However, certain measures closely linked to the stated objectives of the orientation program were successfully applied to a sample subgroup. Although the measures used indicated positive impact, it is difficult to make any definitive assertions about the relative

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[1] <u>Ibid.</u>, pages 63-64.

merits of one as opposed to another orientation program since we have no basis for comparison. Orientation change data were not gathered at other schools and, understandably, the Committee was not interested in creating "control" situations at the Sloan School in the interest of research.

Program and Course Evaluation

The formulation of explicit program objectives, development of course specific goals, and specification of desired learning processes have little substantive meaning in the absence of explicit evaluation procedures. One of the most important contributions which this research made to program management at the Sloan School was to introduce mechanisms for evaluating program and course accomplishments against specific plans and objectives. In this section we will examine representative applications of the research measures in assessing overall program results, individual course contributions to program effectiveness, and comparative course performance.

Program Evaluation

The primary objective of program evaluation is, of course, to determine the extent to which specified educational objectives are being achieved. Since program goals at the Sloan School were designated along learning outcome dimensions program evaluation activities were also learning outcome oriented.

Net Program Impact

It is, of course, difficult if not impossible to take action against the program as a whole. Learning outcomes are changed by modifying the content, structure, or emphasis of particular courses. On the other

hand, the Master's Program Committee had established learning outcome objectives for the entire program and was therefore interested in the net effect of perceived learning outcome change aggregated across all subjects in the program syllabus. Figure 14.5 provides a graphic summary of this type of cumulative analysis in the Spring Term of 1969.

Committee objectives for each course were initially expressed along 18 separate learning outcome dimensions. Following a factor analysis of student Course Evaluation data (fall 1968) these objectives were translated into the new factor structure to permit comparison between committee expectations and student perceptions. (This analysis is not to be confused with a second factor analysis performed upon Course Evaluation data from five graduate schools in 1969. Factors associated with the later analysis are employed throughout most of this book.) The Course Evaluation items on which the factors are based are summarized in Table 14.9.

Comparison of the results in this figure with the preliminary program objectives illustrated earlier in Figure 14.1 is meaningless because of the high variance created by summing across courses. In order to be meaningful, analysis must clearly be performed at the learning process group of key course level.

Learning Process Evaluation

The analysis described in Chapter 11 defined six learning process groups which established the classifications used to categorize alternative classroom interaction patterns at the Sloan School. Figure 14.6 reproduces the Centour diagram based on the discrimina analysis of the final learning process groups illustrated originally in Figure 11.11.

Figure 14.5 Cumulative Sloan School Course Contributions to Five Learning Outcome Dimensions in the Spring, 1969

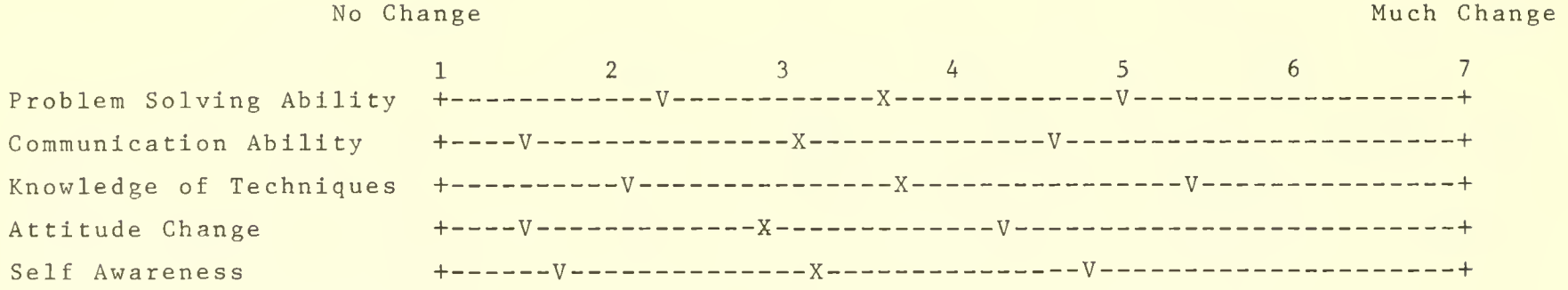
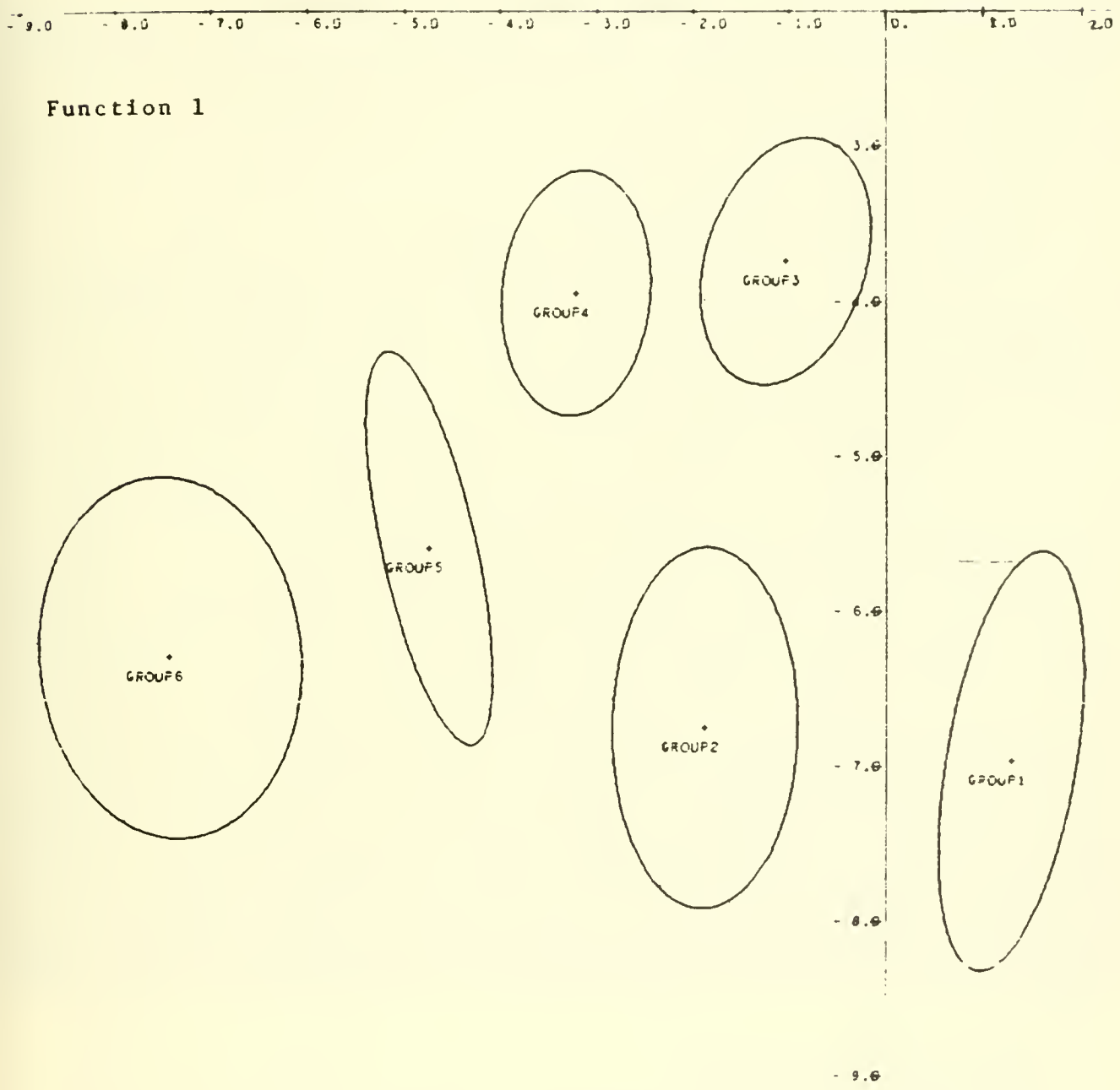


Table 14.9 Summary of Course Evaluation
Factor Composition, Fall 1968

Factor	Questionnaire Items
Problem Solving Ability	Ability to analyze problems
	Ability to apply techniques
	Ability to think creatively
	Ability to identify problems
	Ability to do research
Communication Ability	Ability to communicate ideas
	Ability to sell ideas
	Ability to induce change
	Ability to work with people
Knowledge of Techniques	Knowledge of management techniques
	Knowledge of business principles
Attitude Change	Attitudes toward people
	Attitudes toward business
	Personal attitudes and values
	Willingness to take risks
Self Awareness	Understanding your abilities and limitations
	Goals and aspirations for own career
	Self confidence

Figure 14.6 Centour Diagram Based on Functions 1 and 2 of the Discriminant Analysis of Final Learning Process Groups



Analyses at the Sloan School did not reveal any significant changes in the underlying structure of these groups during the period covered by this research. However, we might hypothesize a situation of the type illustrated in Figure 14.7 in which significant learning process changes have occurred and originally distinct methodological groupings have become blurred. Evaluation based on this type of learning process analysis can be used to monitor the consistency of the educational processes on which the program is based.

Core Course Contributions to Program Objectives

As noted earlier in this chapter, the program manager is particularly concerned with the core courses representing the common subject set to which the majority of participants are exposed. Using data from the Course Evaluation Questionnaires the Sloan School Master's Program Committee was able to track the perceived change along selected learning outcome dimensions attributed to each core course over a term.

Both the factored initial objectives and actual results achieved on five learning outcome dimensions are illustrated in Figure 14.8 .

It was also possible to compare committee expectations against measured student perceptions for core courses taught in different terms over a number of years, yielding a historical perspective. Figure 14.9 illustrates differences in mean responses between the Mathematics for Management II course as taught in the Fall 1968, Spring of 1969, Fall of 1969 and in the Spring of 1970, and displays the committee ideal expectation of 1968.

Total Course Contribution

Figure 14.10 illustrates the contribution of 55 monitored courses to

Figure 14.7 Hypothetical Student Learning Process Overlap Between Subject Groups

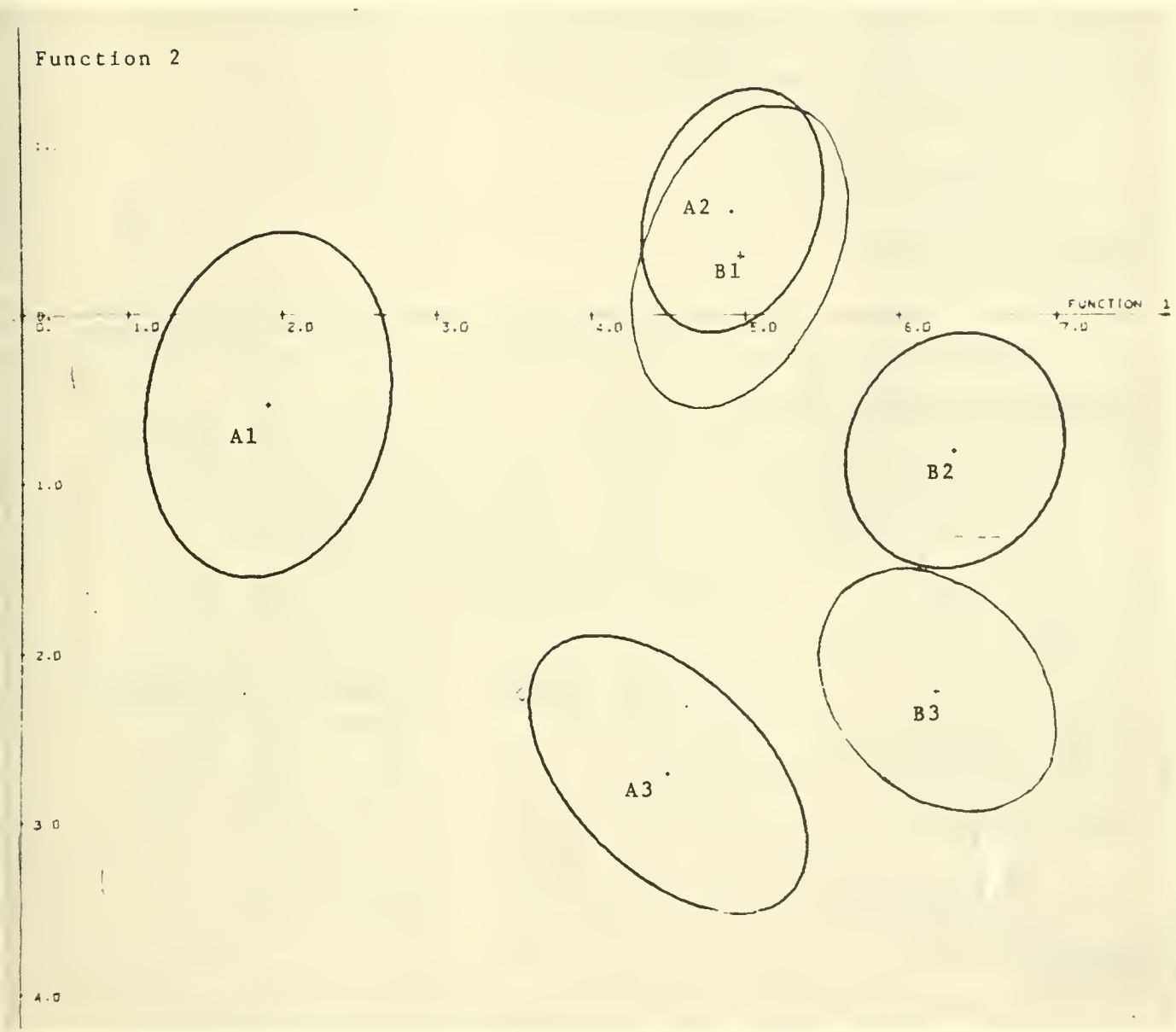


Figure 14.8 Comparison of Program Committee Objectives for Core Courses with Student Course Evaluation Measurement

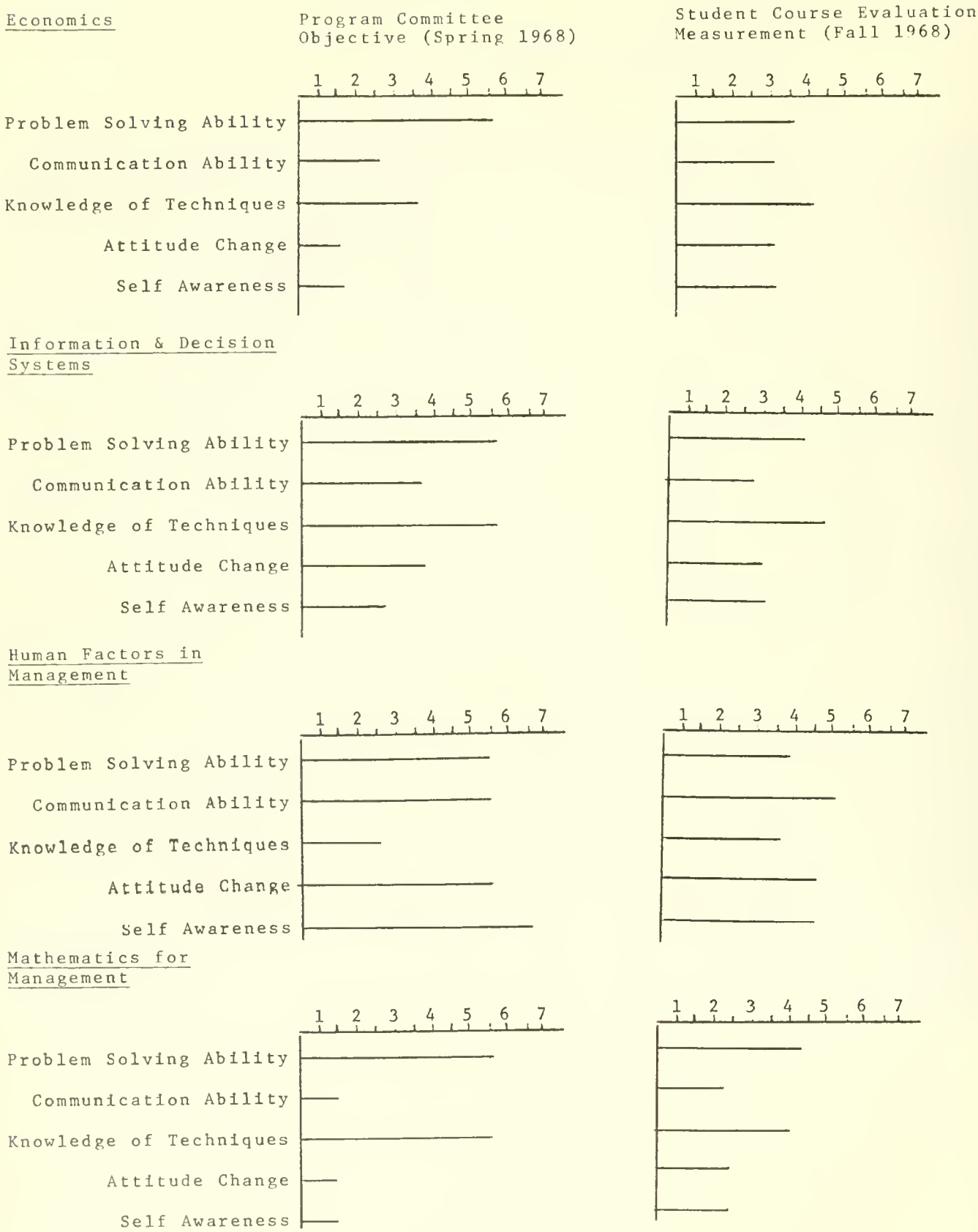


Figure 14.9 Comparison of Student Mean Responses for the Mathematics for Management II Course Over Four Terms with the 1968 Planning Committee Expectations

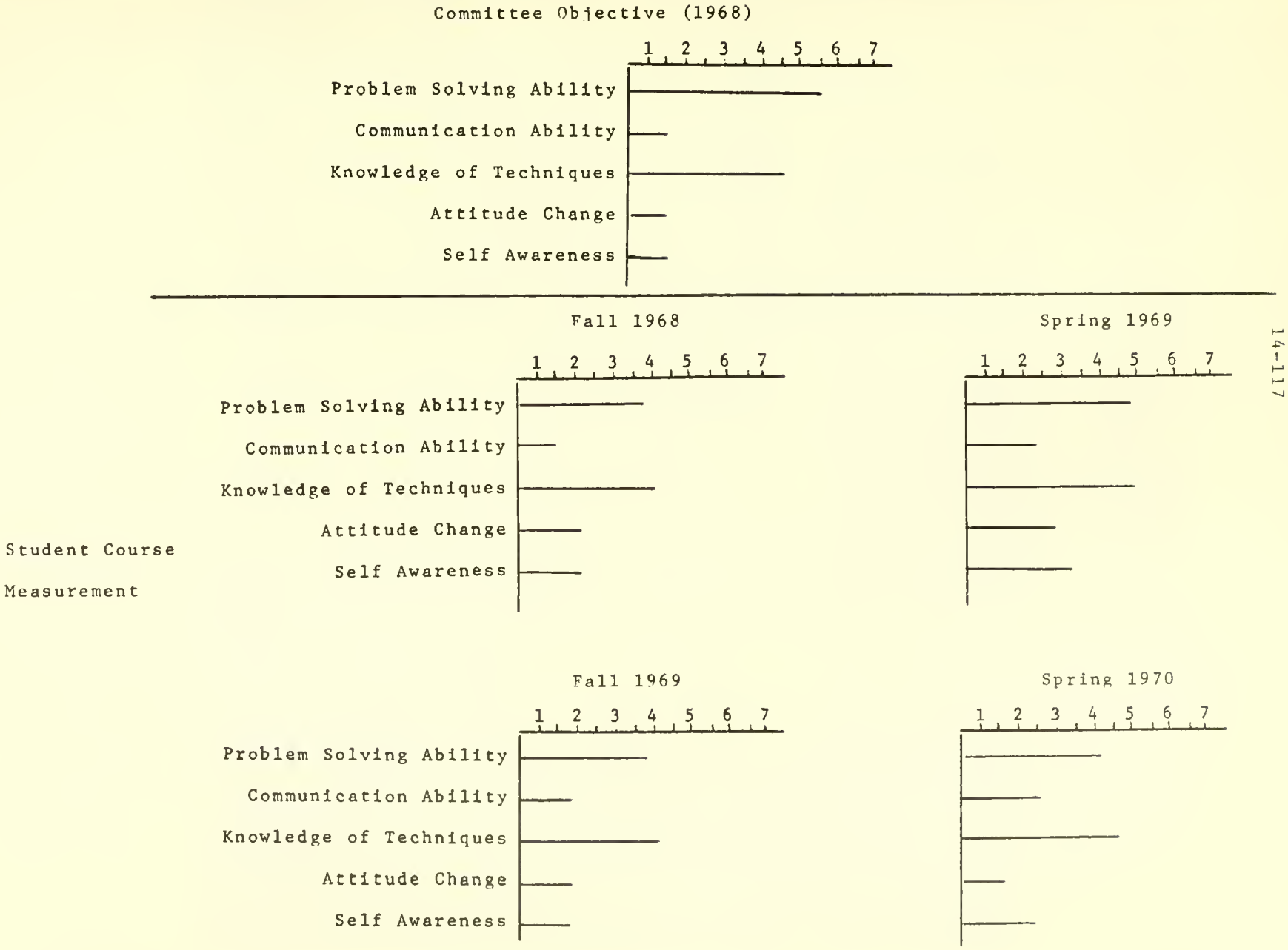
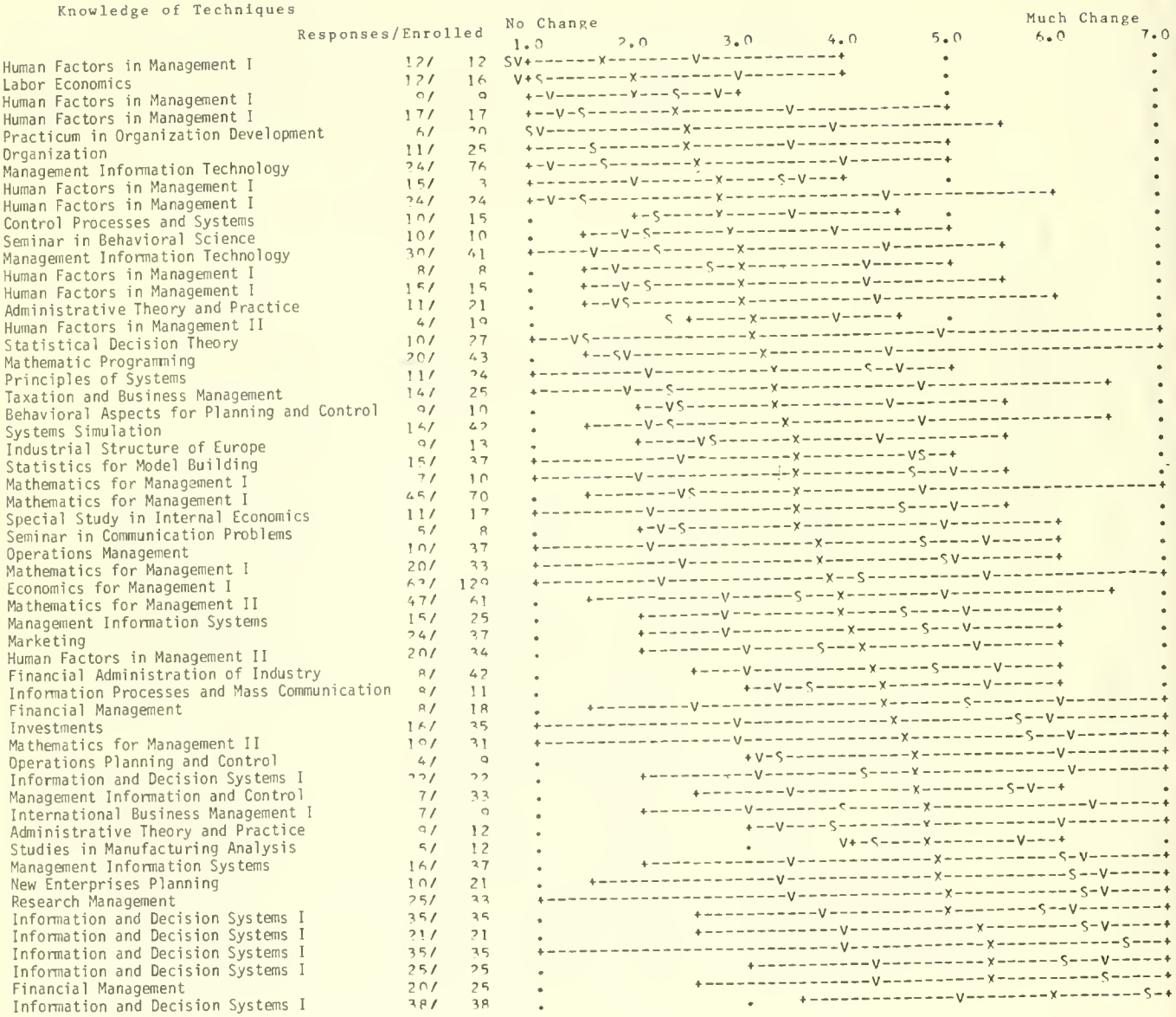


Figure 14.10 Multi-Course Comparison Along the Knowledge of Techniques Factor


Knowledge of Techniques
Responses/Enrolled
No Change
Much Change
1.0
2.0
3.0
4.0
5.0
6.0
7.0
Human Factors in Management I 12/ 12
Labor Economics 12/ 16
Human Factors in Management I 9/ 9
Human Factors in Management I 17/ 17
Practicum in Organization Development 6/ 20
Organization 11/ 25
Management Information Technology 24/ 76
Human Factors in Management I 15/ 3
Human Factors in Management I 24/ 24
Control Processes and Systems 10/ 15
Seminar in Behavioral Science 10/ 10
Management Information Technology 30/ 41
Human Factors in Management I 8/ 8
Human Factors in Management I 15/ 15
Administrative Theory and Practice 11/ 21
Human Factors in Management II 4/ 19
Statistical Decision Theory 10/ 27
Mathematic Programming 20/ 43
Principles of Systems 11/ 24
Taxation and Business Management 14/ 25
Behavioral Aspects for Planning and Control 9/ 10
Systems Simulation 14/ 42
Industrial Structure of Europe 9/ 13
Statistics for Model Building 15/ 37
Mathematics for Management I 7/ 10
Mathematics for Management I 45/ 70
Special Study in Internal Economics 11/ 17
Seminar in Communication Problems 5/ 8
Operations Management 10/ 37
Mathematics for Management I 20/ 33
Economics for Management I 63/ 129
Mathematics for Management II 47/ 61
Management Information Systems 15/ 25
Marketing 24/ 37
Human Factors in Management II 20/ 34
Financial Administration of Industry 8/ 42
Information Processes and Mass Communication 9/ 11
Financial Management 8/ 18
Investments 16/ 35
Mathematics for Management II 19/ 31
Operations Planning and Control 4/ 9
Information and Decision Systems I 22/ 22
Management Information and Control 7/ 33
International Business Management I 7/ 9
Administrative Theory and Practice 9/ 12
Studies in Manufacturing Analysis 5/ 12
Management Information Systems 16/ 37
New Enterprises Planning 10/ 21
Research Management 25/ 33
Information and Decision Systems I 35/ 35
Information and Decision Systems I 21/ 21
Information and Decision Systems I 35/ 35
Information and Decision Systems I 25/ 25
Financial Management 20/ 25
Information and Decision Systems I 38/ 38

perceived student change along the single learning outcome dimension, "Knowledge of Techniques." While core course data and learning process group information are more directly actionable, displays of the type illustrated in Figure 14.10 helped the Program Committee to evaluate the relative contribution of core, concentration option, and elective courses to specific learning outcome objectives. These displays were also helpful in establishing the "reasonableness" of the information obtained via the Course Evaluation Questionnaires.

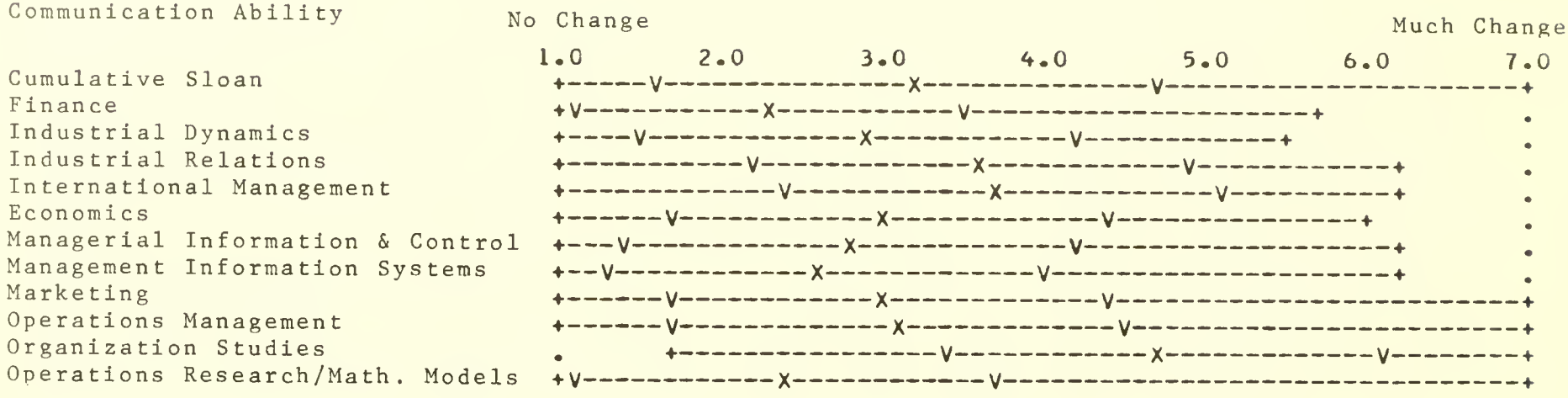
Course Specific Evaluation

Course evaluation data of the type used by the Master's Program Committee for overall program evaluation were also made available to departments, functional groups and individual course instructors. In each instance, data relating to the course or courses of interest to the individual or group were presented in conjunction with appropriate references (e.g., the total program, core subject, or specified reference groupings). For example, all courses given in the Fall of 1968 were separated by their option or concentration affiliation, and change statistics presented by option were prepared for the program planning committee and department heads. Student perceived change in communication ability attributable to courses in specified options is displayed in Figure 14.11.

Selected Subgroup Comparisons

Generation of data for a selected subset of courses along a composite set of learning outcome and course impact factors may be drawn selectively from the total program population. The resulting elimination of courses which are not of interest in the particular context

Figure 14.11 Student Perceived Change in Communication Ability Associated with Sloan School Options in the Fall of 1968



greatly simplifies the comparative analysis problem for the faculty member(s) requesting the report. For example, faculty members teaching core courses were supplied with course evaluation data comparing all of the separate sections of core courses along the learning outcome dimensions. Figure 14.12 illustrates this type of selected subgroup comparison.

After experimenting with both graphic and tabular information presentation, the research group decided to present all comparative data in graphic form. The use of visual displays appeared to increase the ease of data assimilation, and facilitated cross comparisons of responses from different courses and categories.

Graphic presentation gives a more "qualitative" feeling to analyses and eliminates the temptation to attach great significance to small differences -- a problem which is frequently encountered when faculty members work with numerical data displayed in tabular form.

In a similar sense, the use of displays based on factor-scored data rather than raw response distributions led to broader conceptual discussions and minimized pedantic concerns for marginal differences in between-course responses.

Individual Course Evaluation

The faculty member responsible for each monitored course was also provided with output of the type illustrated in Figure 14.13. This example gives the instructor responses from his course (e.g., Marketing), other subjects focusing on similar material (e.g., Business Game), his discipline or functional references group (Marketing Option), and the Master's Program as a whole (Sloan), along individual learning outcome

Figure 14.12 Selected Subgroup Comparison

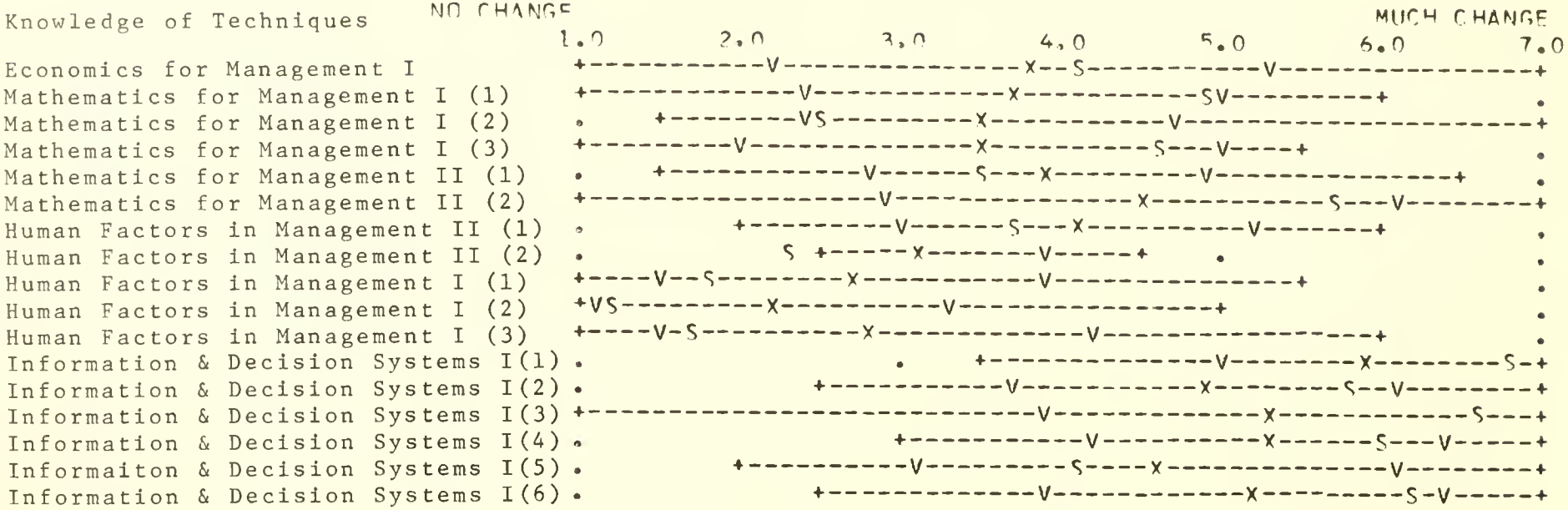
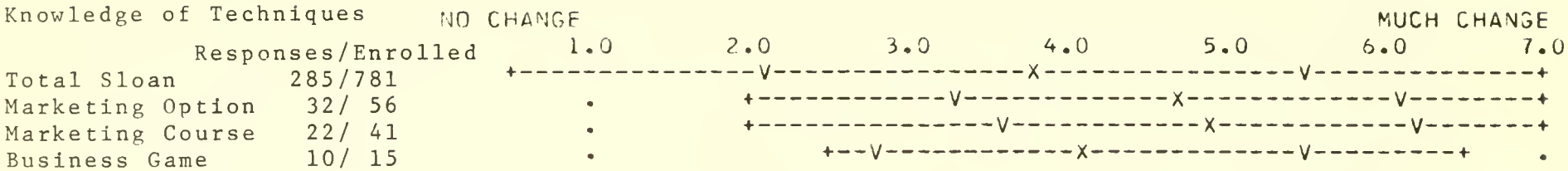


Figure 14.1[3] Example of Individual Course Report



dimensions, in this case the Knowledge of Techniques factor.

Faculty Response to Course Evaluation Questionnaires

Introduction of a detailed Course Evaluation Questionnaire raises many questions. How will faculty members regard student assessment of their courses? Will they give 'credibility' to student perception and insights? How will they react to a research team "fitting their courses into a standardized questionnaire and performing comparative analyses?" Will there be a xenophobic response to 'outsiders' invading the private faculty fiefdom - the classroom? Or will the faculty welcome this type of evaluation as a useful form of feedback? Will the questionnaire be acceptable to those responsible for diverse courses; courses with differing content, pedagogy, teaching styles and philosophy? How will faculty members interpret and use the course evaluation data? What political issues will be raised by faculty 'ratings' of this sort?

Any evaluation procedure encompassing a broad range of courses is a natural catalyst for faculty as well as student reaction and speculation. Since the cooperation and support of both groups is required to achieve effective evaluations, their responses are of great concern to the Program Manager who hopes to obtain meaningful tracking data from them, as well as to the research group. Their inputs, or the lack of same, are therefore crucial to the success of management

The qualitative interview was designed to elicit faculty responses in four areas: (1) Reactions to the overall usefullness of the questionnaire, structure and content; (2) Comments regarding the relevance and applicability of specific questions included in the Course Evaluation Questionnaries; (3) The validity of questionnaire analysis and form of presentation; and (4) Organizational (political) issues raised by the dissemination of this type of information.
evaluation and control as well as research.

Following the distribution of course specific reports in the Spring of 1970, sixteen faculty members, representing a cross section of disciplines and functional areas were interviewed to determine their reactions to the Course Evaluation data and their use of the reports. The sample included different age groups, tenured and non-tenured faculty and individuals using different teaching methods.

General Reactions

Comments under this heading were solicited by the question:

> "Is the course evaluation questionnaire a useful tool? Will you continue to distribute it in your classes in the fall?"

A tabulation of overall faculty responses to this question yielded thirteen yea's and three nay's. However, almost every response was qualified by one or more remarks. The following are representative of the comments associated with favorable reactions.

> It (the course report) is a net addition. Otherwise we don't have any cross-course comparisons.
>
> I feel that the questionnaire is an extremely helpful managerial tool.
>
> The questionnaire avoids the static you get in usual informal feedback where loudest voices get the most attention.
>
> The evaluation reminds me that other people are doing things differently than I am.
>
> What you expect to see is confirmed. It is comforting in that it reflects my idea of reality.
>
> It's better than informal scattered reports...better than nothing.

Some observations by the yea sayers reflected ambiguous feelings (or perhaps simply glibness.) The following are representative.

> It (the Course Evaluation report) told me I was over 30.
>
> I'd pay $10 for it.
>
> Not for my course, but it's good as a program evaluation.
>
> It's useful but I don't always understand the printout.
>
> It's interesting, just like it's interesting to look into a mirror...as long as the glance is cost free.

> I felt 'blah' about it, but also feel that it is something we 'ought' to do! (This comment isn't really qualified, but then again, it certainly isn't positive.)
>
> It's useful just because it reminds me that some (other) evaluation should be done - but it's definitely too long.

Comments associated with negative responses tended to focus on the special or private nature of the respondent's course.

> Absolutely NO. PERIOD. Evaluation is my responsibility and should not be imposed from outside.
>
> My own questionnaire would be more useful. (This faculty member, in spite of his comment and a long and distinguished career, had never administered his questionnaire in one of his courses. Two other faculty members, however, had developed their own instruments which they preferred to use and did employ.)
>
> Measures only make you feel bad - they give you no indication of the cause.
>
> I have not used the questionnaire in the last three semesters and won't use it next year because it's just not fitted to my course... The decision to use the questionnaire should depend entirely on the course... I feel personally that it is only suited to hard core courses.

Some interviewees suggested specific improvements or changes for inclusion in future questionnaires:

> You should include a measure of student involvement in the course.
>
> The course evaluation should be related to faculty objectives. (Since the questionnaire incorporated the objectives of the faculty planning committee, this remark really means that the evaluation should be related to this instructor's particular objectives.)
>
> Reporting should be course-specific to eliminate irrelevant items. Measures are not fitted to particular courses - some items are ambiguous when applied. Please show me only items related to my course.
>
> I want more specific items. (Further probing failed to produce specific examples of the type of specific items desired.)

> Only show me information with significant variation - not piles of information for me to leaf through.
>
> Maybe you could have one of your programs indicate on the graph which course is mine - it's difficult to tell with so many courses.
>
> Is it necessary to distribute questionnaires every semester? I suggest once a year..once in awhile as a check.

Question Relevance and Applicability

All sections of the questionnaire (with the single exception of student semantic differential description of professor personality traits), were noted by one or more faculty members as 'relevant' or 'useful', providing information to 'base change upon.' Similarly at least one faculty member attacked each type of data as 'worthless', 'irrelevant', or 'ambiguous.'

Among those commenting positively on the usefulness or relevance of data from particular questions, there was a marked preference for 'practical' items, measuring facets of course presentation content and structures which could be easily and visibly changed, as opposed to more abstract items measuring changes in student skills and attitudes. Open-ended comments made by students on an "Additional Comments and Suggestions" sheet attached to the formal questionnaire were particularly popular with the faculty.

The Course Evaluation items that received the largest number of positive mention were those in sections 3 and 4 of the report focusing on student feedback, whether the course should be required, course organization and presentation, student time spent preparing for class, quality of texts and degree of working pressure.

Validity of Questionnaire Analysis

The many and varied comments concerning question validity will be illustrated with representative quotes from individual faculty members.

> The sample size for my course was erratic - the large non-response tends to negate meaning.
>
> A relative scale is useless..one person's '7' does not equal another's '7'.
>
> Are these numbers addable, multiplyable, skewable?
>
> My course was very different one year to the next, but the difference did not show up in the numbers.
>
> Do questions mean the same thing to students as they do to us?
>
> Can students discriminate on these dimensions and make sane answers?
>
> I am not concerned with what student's perceive...but what actually happens.
>
> Can you ask indirectly 'how much did you learn?' ... isn't it better to have a skill test...an absolute value test?
>
> What about interrelated change - change caused by the interaction of courses upon the student?
>
> Some dimensions you are measuring need elaboration. For instance, there are many types of knowledge - i.e., 'integration', 'information', 'factual material'... (An extended lecture followed)
>
> Why not ask the student 'can you write or speak better' rather than be esoteric with your change in student's 'communication ability'?

Organizational (Political) Issues

We have been concerned thus far with methodological and administrative aspects of faculty reactions to course evaluation procedures; issues regarding questionnaire content, statistical analysis, modes of displaying scaled data, etc. There are other highly emotional and

political issues involved when faculty and students are asked to report their responses to the educational process. Kenneth Eble, in the Recognition and Evaluation of Teaching, introduces the problem in this way.

> Evaluation is a loaded word. Faculty members are not different from other human beings if they stiffen slightly at the prospect of being evaluated. How does one go about evaluating as complex and personal an act as teaching, anyway? If we could evaluate teaching, would it lead to improvement? And how can we either evaluate or improve teaching when we don't know what good teaching is?
>
> These are troubling questions for the college professor, the moreso because faculties have had so few reservations about evaluating the learning of students. The questions are not, however, quite without answers. We know, for example, a good deal about effective and ineffective teaching. Certainly the hundreds of thousands of teachers who appear before students every day have some sense of the effectiveness or ineffectiveness of what they are doing. The individual teacher knows, in the pragmatic sense, that this direction is better than another, this approach has worked in the past and may work today, that these acts and attitudes on his part seem to invite the student in and incline him, at the least, toward learning. [1]

No matter how course evaluation data are presented, the spectre of faculty comparison and performance evaluation is ever-present. Although there are faculty members who welcome this form of evaluation and student feedback, others feel that the classroom environment - the heretofore sacred realm of the individual professor - is being 'invaded' by those intent on comparative measurement. To them such measurement is "a threat to academic freedom and a "violation of privacy." They fear that the

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[1] Eble, op.cit., page 8.

protective atmosphere where creativity and intellect flourish may be threatened and even destroyed by the aura of competition inspired by course evaluation forms. Not only the individual faculty member's rapport with students, but also the comaraderie of the intellectual community may be undermined by the competitive environment associated with comparative measurement. Such measurement of classroom performance is viewed by some as highly divisive for colleagues and a cheapening, marketplace experience for the teaching profession.

Others argue that rigorous measurement will discourage innovative efforts - that it will stifle exploratory attempts that involve risk, and will encourage entrenchment in the tried-but-true method used in the past. Many point to the potential harm to individuals that could be brought about by the misuse of the questionnaire.

Another concern is that faculty members who perform well, or who are able through wit and/or technology (or both) to provide better classroom "theater," will have better evaluation results than those honest, straightforward (and occasionally dull) faculty members who present the material carefully and well using traditional techniques. The faculty member who has developed a popularized 'dog and pony show' (which rightly or wrongly is viewed as being light on content) may be able to 'fool' the students into giving him positive course evaluation feedback. (This attitude is centered about a common, rather Puritan perception - if the student enjoys a course too much, he can't possibly be learning the material.)

Discussion of the political aspects of faculty ratings was opened with a question posing potential negatives, "Do you feel that ranking

student assessments of courses is unfair and possibly harmful to a professor?" Positive (non negative) responses to this question emphasized the value of comparative data.

> Ranking by means of sorting information determines your standing and is a good thing.
>
> The number of measures avoids global attitudes and the possibility of conducting a personality contest. Breaking into categories protects the individual.
>
> Rankings clarify the discussion.
>
> Rankings are damaging...but it is better to damage in an orderly fashion. (The professor refused to elaborate.)

Negative or concerned reactions generally implied the possible inappropriate application of data.

> I feel that some people use the data as a source of information for promotion decisions. (In context, this comment had a definite negative connotation.)
>
> The privacy issue is important here - the information can change the nature of my job.
>
> People may eventually distort the information for their own benefit. I could have filled out all of the questionnaires myself.
>
> Rankings can be dangerous. (No further comment.)
>
> It is extremely dangerous when the model drives the process.
>
> I do not like to be measured by others on items that aren't important to me.
>
> The senior faculty likes your research project to do evaluation of junior faculty for them. It's a real pain for them to have to sit in on our courses to do their own evaluation. (This by far is one of the most cynical remarks gleaned from the interviews.)

In final analysis 16 faculty members described 16 distinct preferred modes of course evaluation. All were involved and deeply concerned with the evaluation question - which is understandable since it affected them directly. Although some may have emphasized negative problem related reactions in this section, it is important to remember that the overall tally of faculty comments was positive, though qualified.

Student Participation in Research

The student populations studied in this research were experienced and sophisticated questionnaire respondents.[1] Their generation has been subjected to more questionnaires and tests throughout its educational experience than any previous generation. These college and graduate students were also sensitized by the events of the late 60's. Some were quick to perceive (and report) an astounding range of dire consequences that might (would) follow from participating (collaborating) in this type of research. Others were quick to challenge perceived "irrelevancies", "ambiguities", "petty bourgeois sentimentality", and "establishment values" present in the measurement instruments. Still others reacted very positively to the implied "concern with the purposes of education" and commented on the questionnaires' catalytic effect on their thinking.

Students were not alone in their sensitivity to the times. The Harvard Business School administration would not participate in this research during 1969, suggesting that we would be well advised to "wait

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[1] The reader who questions this assertion is referred to "The Testing Maze", in Black, They Shall Not Pass. New York: William Morrow and Company, 1963, pp. 26-35.

until the situation is more normal" before undertaking such a study.

Student Reactions to Pre and Post Term Questionnaires

It might be noted that undergraduates were the most prolific writers. Graduate business students contributed only a handful of comments. This difference may be explained by the questionnaires' management orientation. Graduate students were more interested in the subject matter, found it more applicable to their areas of concern, and were less apt to attribute sinister intent than undergraduate liberal arts majors.

Comments ranged from crude and highly emotional expletives to insightful, constructive, and extremely analytic suggestions. The following quotations are representative of both positive and (printable) negative comments returned with the questionnaires.

A large percentage of undergraduate comments indicated frustration with the management oriented questions, (particularly the request to describe a typical manager and the 94 item Personal Opinion Questionnaire). The following comment is representative.

> I find it virtually impossible to give meaningful answers to the last part of your questionnaire. There are 'pros' and 'cons' to each item concerning business management - I frankly have no clearly thought-out opinions in matters of this kind... After all, how do most students know anything about business - you're getting totally political views. How can anyone answer with little or no first hand experience?

This student was clearly troubled by questions in an area in which he had no personal experience. This frequently encountered and understandable reaction of non-business majors is particularly noteworthy because of the student's awareness of the "political" basis of his current views. In terms of this research these "purely political" attitudes and opinions were totally relevant. They were, after all, indicative of the

students' current feelings about business and management as a profession. A few students took an opposite viewpoint - exhibiting greater interest and concern with detailed distinctions:

> The nature of many questions does not give adequate consideration to entrepreneurial management. Rather, you seem to emphasize the larger corporation. Question #27 says 'salary'. What about net worth? Are we to include the effects of inflation in our 20 year salary estimate?

The length of the Pre-Term and End of Year questionnaires generated a number of comments. Several students suggested we pay them for their efforts. "At $2,50 per hour which is the going rate for research assistants you owe me over $10.00 just for completing your questionnaires." Undoubtedly the most extreme reaction was communicated by a school physician's laconic notation on the cover of one questionnaire booklet, "Student fainted during exam."

Written comments by women respondents frequently expressed concern with the questionnaire focus. The following two are indicative.

> This questionnaire is annoying - the flagrant male chauvinism is frightening and disgusting.

> I don't think this questionnaire was to be aimed at females and wish you had included some questions on topics that will concern young women as much as industry concerns the male sex. For instance you might ask questions about how and when I'm going to raise my family.

Some students reacted negatively to the use of identification numbers, and a loss of identity and humanity that they associated with the creation of a data bank, the use of computers and statistical aggregates. These responses ranged from the vituperative, "YOU CAN'T FOOL ME WITH YOUR TECHNOLOGICAL, TOTALITARIAN, MANIPULATIVE, INHUMAN DATA GATHERING

HORRORS!", to the more contemplative

> Commodities. It is easy enough to gather, sort, categorize, and distribute commodities - but thoughts and ideas are not commodities. This questionnaire pretends to determine "student opinion" by compressing hard and dangerous problems into meaningless conundrums, and asking the businessman-of-tomorrow to answer them.

The above is a small excerpt from a lengthy essay objecting to the questionnaire's quantitative orientation. The treatise was signed:

"Respectfully yours,

464895000

Time: 0.341 sec
Off at 3:48

Others rejected the questionnaire as a presageful invasion of privacy.

> If I seem to be rude or uncooperative, please be assured that that is not my intention. I do not intend to be rude, just uncooperative. In my opinion, my responses to these questions are none of your business.
>
> P.S. There's only one thing that bothers me: the above constitutes a response.

This concern for privacy extends to grades and academic records as well as opinions. In the grading study noted earlier, students at the M.I.T. Sloan School were asked "Who should be allowed access to your grades and records?" Students were unanimous in their belief that only the faculty member teaching a course, and prospective employers with explicit prior student consent, should be granted access. All others were to be categorically excluded. The students wanted all

records of their performance kept strictly confidential. It is not too surprising therefore that a significant number of the students interviewed in this study expressed concern over the confidentiality of data relating to their attitudes, opinions and values.

As noted earlier, many students responded positively to the questionnaire's structure and content. The following comment is representative.

> This questionnaire gave me the opportunity to pause and reflect upon my interests, objectives, and opinions - an experience which provided some personal satisfaction for me. How in the world was I selected anyway?

Student Reactions to Course Evaluation Questionnaires

Student reactions to the course evaluation procedure at Sloan were obtained by inviting a cross-section of students to informal sherry hour meetings with members of the Program Planning Committee once each semester. The course evaluation procedure was only one item on the agenda for these sessions - along with reactions to the educational program, discussion of individual course experiences, and plans for future programs.

Student reactions to the questionnaire can be categorized under three basic headings: questionnaire content, anonymity, and use of data.

Questionnaire Content

Students shared the faculty preferences for items focusing on the classroom environment and faculty performance, as opposed to those designed to measure perceived change (the learning outcome dimensions). They also emphasized the value of the Additional Comments and Suggestions sheets, which enabled them to offer specific criticisms of commendations to faculty members. The semantic differential description of professor personality

traits was generally unpopular.

Anonymity

Some students were troubled by the use of student identification numbers on questionnaire forms. This problem was particularly critical at M.I.T. where student Social Security numbers are used for identification. Despite repeated assurances that data were confidential, and stored in a manner that precluded associations with particular identities, students continued to be uneasy about the eventual fate and/or use of the information they provided. The act of writing an ID number at the top of a "confidential" evaluation definitely required a high level of trust between participants and researchers. Although that trust was never betrayed, some students were hesitant to supply their identification numbers.

Data Utilization

Students were particularly interested in the use of the course evaluation data. Concerns varied widely but the general feeling was, "If I take the time to fill in the questionnaire, they'd better do something with the data." Some students felt that composite responses should be distributed to every student, faculty member and administrator at the end of each term. Others were opposed to distribution to anyone but the faculty member who taught the course and, possibly, his supervisor.

Students expressed interest in how data were used (if at all) by individual faculty members, the Program Planning Committee, and the Personnel Committee (in tenure decisions). The common concern is well summarized in the following excerpt from one student's evaluation.

> At the end of the term we fill in detailed forms which are then converted into a mass of statistics about the various courses. However, I see no indication that these

> statistics are used. If this is so, it is time we stopped filling in these forms - and if it is not, it should be made apparent how the statistics are used.

Actual data utilization ranged from categorical rejection, to complete dependence. It was impossible to achieve consistent approaches to questionnaire results among faculty, administrators or students. Despite extensive discussions among faculty and administrators, Program Planning Committee use of the data and student reviews, data utilization continued to be a matter of individual perrogative. The lack of systematic mechanisms for structuring and resolving issues raised by the evaluations produced speculation, frustration and in some cases cynical disenchantment.

In the absence of agreement among participants regarding the role of data based evaluation, isolated attempts to apply data in decision making may be suspect. One example will highlight the problems engendered by irregular use. During the second year of Course Evaluation questionnaire distribution at the Sloan School, an angry group of students marched into the research office to protest what they perceived as a "diabolical" use of course data. Rumor had it that comparative Course Evaluations had been used selectively by a department head in the promotion evaluation of one junior faculty member. The students argued that comparative evaluations presented in isolation without meaningful references were to blame for the unfavorable decision. They felt that such data, if used at all (and they had reservations) should be applied in all or none of the promotion decisions. Although several critical factors entered the case in question, the comparative questionnaire evaluation became a highly visible target.

Such incidents accentuate the need for a coordinated evaluation program consistently applied in a recognized manner throughout the

educational system. It also emphasizes the need for student, faculty and administration discussion of the nature and extent of data utilization.

Student Power

A recent issue is the new student demand (with some faculty and administrative support) for involvement in educational policy decisions, and of special interest to us, participation in tenure decisions. Proponents of increased student involvement argue that the student should have an active voice in influencing the quality of his educational experiences. They naturally support the inclusion of student perceptions of teaching effectiveness as a valid input to overall evaluation of faculty performance, in combination with other measures of teaching, research and service for consideration in tenure decisions.

Where will it all end? Art Buchwald touches some sensitive nerves in his tongue in cheek prediction of future faculty evaluations in this section from the Son of the Great Society:

> There seems to be a trend in universities these days to have college students rate their professors. Some schools are even setting up student boards to decide whether a teacher should get tenure or not. If it continues, we can well imagine the following scene.
>
> A board room with three somber students studying a dossier. There is a timid knock on the door. "Come in," one of the students shouts.
>
> Enter Professor Higgins, nervously biting his lip. The three students study him for almost a minute. Then the chairman speaks: "You can smoke if you want. Professor, this report does not look very good. It says you slur your words, have a very annoying habit of clearing your throat, and your handwriting on the board leaves much to be desired."
>
> "All I'm asking is another chance," Professor Higgins pleads.

One of the other students says, "Higgins, I would like to remind you that your parents went to a great deal of trouble to make you a professor. Is this how you repay them?"

"I'm sorry, gentlemen. It's just that I've been writing my book on Antarctic philosophy and I haven't had enough time to work on my lectures."

"A likely story," another student says. "If you ask me, you're spending too much time thinking about your wife and children. This is not a country club, Higgins, and the sooner you discover this, the better off you're going to be."

The chariman says, "The report also states that you give too many exams and rely too much on outside references. What do you have to say to this?"

"I don't want to complain, but the students are always picking on me. I just can't seem to do anything right."

"Higgins, I'd like to ask you this question. How many hours of television do you watch at night?"

"Two hours, maybe two and a half."

"Why don't you cut it down and shape up to your responsibilities? Decide what you want out of life, Higgins. We're here to help you but we can't do it if you don't help yourself."

"I'm trying to," Higgins says, "but it isn't easy. There's so much pressure on a professor these days that I seem to lose sight of my goal."

"Don't you think it's a simple matter of discipline, Higgins? You've got to identify with your subject matter. Here in the report it says you're constantly quoting from your own books. Do you call that teaching?"

"Higgins," the chairman says, "I don't want to get off the subject, but it also says in the report you seem to concentrate on the coeds in the first row when you're lecturing. Do you have any excuse for this?"

"No, sir."

"What are we going to do with you, Higgins? What are we going to do with you?"

"Maybe I could take an aptitude test. Perhaps I'm teaching the wrong subject?"

"If we let every professor teach the subject he was most qualified for, Higgins, where would the university be?"

"Higgins, we're going to put you on probation. We are going to assign a student to tutor you, and you will report back in two months. If you don't show any improvement, we're going to have to ask you to leave."

"Thank you, gentlemen. I'll prove your faith in me. You won't regret it."

"We like your spirit, Higgins. Now let's see you measure up. Good day."

The chairman takes out a new dossier. "Who is next? Oh, no. Not the Dean of the Business School again?"[1]

Organizational Considerations

In the interest of simplicity, we have examined the operating issues associated with program management from the perspective of an individual program administrator with clearly delegated line authority. Earnest explorers who have machetied their way through the dense bureaucratic undergrowth of the university jungle know this to be a fanciful fiction. Direct line management is seldom found in the university environment.

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[1] Art Buchwald, Son of the Great Society, Copyrite G.P. Putnam's Sons: New York, 1965 and 1966. Quoted with permission.

Administrative Roles

Academic organizations function through involuted political processes that would challenge the creative skills of the most imaginative Industrial Dynamics enthusiast.

The Administrator

The role of the college administrator at the school, department or program level, is most often that of an overtly passive "catalyst toward consensus." Most successful academic administrators have become painfully aware of the discordant responses produced by the faculty on the slightest provocation, and have learned to play this most sensitive of all organizational instruments only after careful tuning and with gentle caresses from a slightly rosined bow. Pizzicato and other quick or strong techniques are seldom used for fear of breaking strings, jarring the bridge, or otherwise disturbing the delicate instrument's equilibrium.

In keeping with this orientation, academic administrators seldom propose startlingly new approaches or direct action plans. Their commitment to prior consensus exceeds the comprehension of mere mortals. Their strategies are carefully formulated with the recognition that "there is only one argument for doing something; the rest are arguments for doing nothing."

> The argument for doing something is that it is the right thing to do. But then, of course, comes the difficulty of making sure that it is right.
>
> Even a little knowledge of ethical theory will suffice to convince you that all important questions are so complicated, and the results of any course of action are so difficult to foresee, that certainty, or even probability, is seldom, if ever, attainable. It follows at once that the only justifiable attitude of mind is suspense of judgment; and this attitude,

> besides being peculiarly congenial to the academic temperament, has the advantage of being comparatively easy to attain. There remains the duty of persuading others to be equally judicious, and to refrain from plunging into reckless courses which might lead them Heaven knows whither. At this point the arguments for doing nothing come in; for it is a mere theorist's paradox that doing nothing has just as many consequences as doing something. It is obvious that inaction can have no consequences at all.[1]

The managerial admonition, "not to decide is to decide" is thus antithetic to the fundamental premise of traditional academic administration.

Committees

Faculty, faculty-administration, and faculty-student administration committees are the bulwark of the high inertia academic concensus formation process. Given the diverse interest groups existent in a university, representatively structured committees can be a useful mechanism for developing ideas and coordinating the implementation of established programs. However, they are seldom effective (and never efficient) decision making bodies. As such they are not apt to be the driving force behind significant academic reform.

> Most plans for educational reform fall short not so much because they are not comprehensive as because they are not coherent; they have not been thought through as a whole by a single mind and are likely to show the signs of their joint composition. One of the most bewildering features of the present agitation in the academy is the proliferation of committees, all manfully struggling over essentially the same problems, all producing virtuous documents which shift the emphases somewhat, usually (under the pressure of

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[1] Cornford, op.cit., page 10.

> circumstances) roughly in the right direction, but which fail to signal the radical changes that are genuinely needed.[1]

Nevertheless, committees serve an important (if not unique) function in academic politics, and no "concerned" faculty member can afford to decline many committee posts and still maintain his credibility as an interested and involved member of the community. As the primary mechanisms for determining what will not get done, committees exercise real power through their formal action. In addition, the chance observations, side remarks, quips, gibes, and facetious comments made at committee meetings establish the priorities, form the alliances, and determine the quid pro quos that seriously impede, if not permanently arrest projects that never appear in the committee's agenda or minutes.

As such, the program administrator must devote substantial time to committee deliberation, and may even find himself working behind the scenes to insure appointment to certain key committees. His ability to accomplish anything through them may be questionable; but the futility of attempting to work outside them is absolute. A committee "...is like a mouse trap; when you are outside you want to get in; and when you are inside the mere sight of the other mice makes you want to get out."[2]

Faculty

Viewed from the program administrator's perspective, one aspect of traditional faculty organization constitutes the primary obstacle to effective program management. The major stumbling block is narrow fun-

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[1] Caws, op.cit., page 89.

[2] Cornford, op.cit., page 10.

ctional and discipline-based faculty alignments and rigid departmental structures.

Function or discipline groupings may be partially valid building blocks from which to construct a broader academic organization. The problem in many universities is that after molding the blocks the contractor left the construction site. As a result nothing was built and, with the passage of time, the blocks lying where they were left have become an accepted part of the landscape. Newcomers argue teleologically that there must be some reason for them or they wouldn't be there, and the old timers have gotten rather used to sitting on them and can see no reason to risk disrupting a perfectly pleasant state of affairs by pointing out that the blocks might be used to build something more functional.

Robert M. Hutchins has pointed out that the functional or discipline-based department

> ... is concerned only with its own specialty. Nobody can control it. I am unaware of any instance in history of a department voluntarily sacrificing its special interests for the sake of the university as a whole. A department has, in fact, no knowledge of the university. It sees other departments as rivals in the competition for money, students, and prestige. [1]

Mortimer J. Adler has suggested that this absence of interdepartmental organization may be an apt allegory of contemporary culture.

> The structure of a modern university, with its departmental separations, and its total lack of order among specialized disciplines, represents perfectly the disunity and chaos of modern culture. [2]

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[1] Robert M. Hutchins, as quoted by Lean, op.cit., page 54.

[2] Mortimer J. Adler, as quoted by Lean, ibid., page 53.

Those concerned with operating problems rather than elegant imagery may be more inclined toward blunt description than picturesque verbiage.

> The internecine wars resulting from departmental empire-building and self-aggrandizement present an ignoble spectacle indeed. Professors achieve recognition through a highly specialized process beginning with the Ph.D. "union card"; they write their books and articles and present papers at professional meetings on highly specialized topics; they acquire scholarly reputations and achieve academic promotions in a vicious circle swirling them ever onward into increasing preciosity. They are identified by "field" of specialization and are discouraged from forming any opinions or making any judgments outside of their "field". And all this in the name of liberal education! A sorry spectacle, indeed.[1]

The need is for direction and integrated commitment to a set of common objectives. In our opinion the program is the logical integrative mechanism. We will elaborate on this contention further in a moment.

Teaching Versus Research

Closely allied to the issue of departmental autonomy is the complex question of the priorities to be assigned teaching and research. Generally the departmental goal structure is more easily aligned with the objectives of a sponsored research project than with those of an educational program. The potential contribution of research to individuals within the group and, thereby, to the department is direct and obvious. Research produces data which become the basis for speeches and publications. These in turn lead to a reputation -- "Professor X at M.I.T. is working in that area."

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[1] Lean, ibid., page 54.

How can mere teaching be expected to compete? In our opinion it cannot if the choice is left to the department and if the allocation of educational resources is independent of contribution to educational programs. Why worry about the quality of teaching in a required graduate course if the same funding is obtained from the educational budget by supplying a senior professor or a graduate student? The only rational procedure is to use the lowest cost resource, (which may or may not be the least effective), in order to maximize the gross profit contributed to the department -- profit that can be used to finance high visibility activities.

Exploitation of educational programs can only be curbed through separate and direct accounting of educational and research expenditures and productivity. We do not claim that research can not contribute to the educational program. It can and should. However such contributions do not occur automatically. They must be planned, budgeted, monitored and controlled. By separating and explicitly accounting for education and research, cross fertilization as well as tradeoffs can be influenced if not managed.

Power to the Program

Much of the current ambiguity and confusion in the university environment can be reduced if policy level management will

- .Give highest priority to educational activities.
- .Make individual academic programs the administrative units for coordinating such activity.
- .Set limited, explicit and measurable objectives from each program unit in consultation with program management.
- .Delegate clear authority (and concomitant resources). to the program unit.

Program Management must then:

- .Convert program objectives into explicit and focused program plans including course specific learning outcome goals.
- .Develop and implement budgets allowing resources (including capital investments) to departments or other faculty units to achieve specified goals subject to policy constraints.
- .Control the application of resources in those areas where achievement of program objectives requires the creation of specific learning processes or the use of certain educational methods.
- .Monitor and evaluate resource utilization and productivity.
- .Demonstrate and substantiate program goal achievement to policy management.

This approach will: force choices among alternative program objectives, courses and educational methods; require consideration and resolution of the financial and organizational problems noted earlier in this chapter; demand that administrators adopt a proactive stance and take action in the absence of consensus; limit faculty and departmental autonomy by placing resources in the hands of program management; and, curtail some current non educational activities by imposing financial constraints.

Inducing and Obstructing Change

During the course of this project, we received many useful suggestions regarding ways to approach the task of inducing change. We also encountered some frustrating obstructions that hindered or stymied our efforts. Since these experiences relate directly to the organizational issues considered in this section, we wish to note some of them here.

While preparing this material, we were introduced to a paper recently prepared by five of our M.I.T. colleagues, "Tactics for Change: Checklists

for the Academic Innovator -- 1972."[1] After reading this delightful treatise we concluded that they had succinctly categorized our experiences as well as several tactics we wish we'd though of and a number of obstructions we were thankful to have avoided. With their permission we will therefore summarize our experiences in terms of their checklists, and strongly recommend that the would-be innovator investigate the full range of their compendium.

Organizational Obstacles

In the three years encompassed by this project, we encountered fourteen of the twenty eight "Effects" reported by our associates. In each instance, extensive detours were taken in an attempt to circumvent the road block. However, we were sometimes forced to turn back and abandon our intended route. The obstacles encountered were:

1. The Entrepreneur Effect: Education innovations are often due to the initiative of one person or very few individuals. As long as the individual or group keeps working on it, the innovation survives. When they stop, it dies.

2. The Isolation-Of-Infection Effect: Related to the entrepreneur effect, this reflects the view of the people in the community about the innovation. By calling it 'Joe's new program', one is excused from becoming involved and may go about one's regular business without seriously considering the innovation.

3. The Threatened-Department Effect: Many changes possible within a department are suddenly not possible if cooperation with other departments is necessary or if partial surrender of autonomy, certification power, or professionalization is implied.

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[1] Robert L. Halfman, M.L.A. MacVicar, W.T. Martin, Edwin F. Taylor, and Jerrold R. Zacharias, "Tactics for Change, Checklists for the Academic Innovator - 1972", M.I.T. Education Research Center: Cambridge, Massachusetts, 1972.

4. The Other-Discipline Effect: Again and again those proposing change hear, "That would be fine in department X, but not in ours."

5. The Tyranny of the Rubric: Any discussion of education must take place in the education department; psychologists are more interested in implanting electrodes than in examining the results of education change; mathematicians own mathematics; and no nonphysicist (defined in terms of degrees earned) may teach physics.

6. The Prima Facie Affront: Whereas I have spent a significant fraction of my professional life perfecting my lectures and otherwise investing conscientiously in the 'status quo', therefore to suggest an alternative is, by definition, to attack me.

7. The Prima Donna Affect (sic): The crucial features of a new format of teaching, necessary for its success, must be modified for my use because my methods and viewpoint are unique, my students are special, and, generally, no one can tell me how to teach my course.

8. "We Tried It and It Didn't Work": Ten years ago, twenty years ago, thirty years ago, when the world was different, somebody tried something not really the same. The confusion between "we didn't do it" and "it can't be done" has deep Freudian significance. Let no man admit to impotence; it is un-American.

9. "We Are Already Doing It": Our present program has features to which one can apply terms similar to those describing the proposed innovation. (On closer inspection our present program has none of the key attributes of the proposal).

10. "It Costs Too Much in Faculty Time": Any change must cross a threshold of planning and initial dislocation. A happy later life is not visible because attention is riveted on the trauma of birth.

11. "It's Fine But It Isn't Academic": Some changes alter the meaning of intellectuality, so are excluded by definition.

12. The Tall Tree Attracts Lightning: Influential professors often feel an obligation to have doubts for the rest of the faculty. A resulting fire that spreads to the underbrush may prove impossible to

smother.

13. The Overloaded Bandwagon: "Since it is good, let's all do it together." The opposition rides the brakes while the innovators goad the horses."

Table 14.14 summarizes the program activities in which each obstacle was encountered. A quick glance at this table reveals that:

- The most frequently encountered obstacle was number 8 - "We tried it and it didn't work" followed by 2, The isolation of infection effect.
- Numbers 1, 9 and 13 -- The Entrepreneur Effect, "We are already doing it" and "Since it's good, let's all do it together", -- tied for third place.
- The greatest number of objections were encountered while setting course objectives and the second largest number while defining measures and setting program objectives.

Tactics for Change

Our associates at M.I.T. noted twenty five "Tactics for Change" -- "Tactics that help changes occur and survive". Seven of these tactics were applied with some success in our project. In addition, four of their observations would have been particularly useful, had we only encountered them sooner.

The seven tactics for change which we strongly recommend based on our experiences are:

1. Wheel in a Trojan Mouse: Sometines you have to change everything in order to change anything. More often you can install a small "experiment" that you know will work and use it as a point of student and faculty infection.
2. Seduce Co-Conspirators: Success of an innovation requires the hard work of first-rate men and women. Never ask for a commitment, particularly in advance. Invite a person to consult with others on the design and installation of the innovation. His commitment will automatically follow his contribution to the (now his) program.

Table 14.14 Locus of Obstacle Incidence

	Obstacles Encountered												
Program Activity	1	2	3	4	5	6	7	8	9	10	11	12	13
Establishing Structure		✓			✓			✓					
Defining Measures		✓	✓	✓	✓			✓		✓		✓	✓
Setting Program Objectives	✓	✓	✓					✓	✓	✓		✓	✓
Preparing Program Budgets	✓		✓					✓	✓		✓		
Setting Course Objectives	✓	✓	✓	✓		✓	✓	✓	✓	✓		✓	✓
Evaluating Course Performance	✓	✓						✓	✓				✓

3. Don't Ask Permission: If a permission-giver is good, include him in the project or on the committee that plans or supervises it. Otherwise appear before all committees and officials as information-purveyor and advice-seeker only. When permission is absolutely necessary, there are usually alternative sources for that permission: choose your friends.

4. Take the College Purpose Seriously: Always a disturbing tactic, but sure to elicit change if pursued vigorously. How can the traditional purpose be put to work in the obviously new circumstance?

5. Be a Wolf in Sheepskin: Identify an already-established program, title, department, bureau, committee, council, or standing procedure with which the innovation can clothe itself. The exhausting procedure of approval is already completed for the covering activity, requiring further enabling concurrence of only a few key people. Your assumption of the label will, of course, be a fulfillment of its meaning that the originators saw only vaguely.

6. Invoke the Majesty of the Name: We make judicious use of the sonorous title "Massachusetts Institute of Technology" to hop over thresholds elsewhere. Even though this may cause resentment, the name can be used by local advocates on their colleagues, often for a net gain. All sorts of names carry conviction: "The president wants ..." and "The legislature has committed itself ..." and "The Danforth Foundation has funded ..." are all symbolic statements of great convincement.

7. Establish Categories of Evaluation Yourself: The alleged virtues of any proposed program carry an implicit statement of the grounds on which the innovation will be evaluated. By making the evaluation categories explicit you can make clear what you propose and also preempt the high ground from which its progress will be surveyed.

We recognize retrospectively that four additional ideas could have helped us avoid many of the previously noted pitfalls. Here they are so that you will not repeat our mistakes.

1. Suppress Surprise: Never cease checking, checking, checking with all whose acquiescence is necessary to the future growth of an innovation. Bring them up to date while asking advice on the latest developments. When some other staff member complains about you, his superior or colleague must feel on the inside, in the know, and must not be surprised.

2. Be Specific But Don't Get Caught In the Briars: People will accept in practice a proposal they would reject in principle. Often by suggesting procedures one can say more and be less threatening than by discussing generalities. On the other hand, label 'all' written statements DRAFT, even the final version. In this way each examiner can feel he influences details and little time is lost wrangling about the wording.

3. Recast the Recollection: "Do you remember that suggestion you made two years ago?", you say to department head or administrator. "Well, I didn't understand it then; now I do. Here is what you meant..." followed by a description of the new innovation.

4. Let the User Add the Eggs: Cake mixes that require only water to be added do not sell so well as those to which the customer adds the eggs. Best of all is for the customer to be in on inventing the innovation. Second best is to have clear in your own mind which features of an innovation are central to its success and to encourage personalized modifications of all other qualities. Anyway, this will return the most new information to you about the process of dissemination.

One final tactic for change identified by our colleagues also deserves particular notice. Its organizational implications are limited and specific. It is directly applicable to an astoundingly broad range of managerial situations but particularly relevant in the current program management context.

"IF ALL ELSE FAILS, RESIGN: You may be the problem!"

APPENDIX

1. Graduate School Questionnaires
   - A. Student Questionnaires
   - B. Faculty Questionnaires

2. Undergraduate School Questionnaires

Graduate School Questionnaires - Student Questionnaires

The Pre Term Questionnaire Booklet

and Answer Sheet*

*The Post Term Questionnaire is simply a pasttense version of the Pre Term Questionnaire with the ommission of Part I of the questionnaire, which deals with personal background information.

MANAGEMENT OF UNIVERSITY EDUCATION RESEARCH

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Alfred P. Sloan School of Management

50 Memorial Drive

Cambridge, Massachusetts 02139

GRADUATE
PRE-TERM QUESTIONNAIRE BOOKLET

---

1. You should have <u>two</u> separate answer sheets to use with this booklet.

2. Please fill in the "Identification Information" such as your student identification number, age, sex, and other requested information in the identification section of the questionnaire.

3. Read the instructions for <u>each question</u> very carefully - they change from question to question.

4. Use a soft lead pencil (Number 2) to record your answers on the sheet by completely filling in the appropriate blank.

5. If you change your mind, erase the first mark <u>completely</u> and make a new mark. Make only one mark for each question.

PART I

This section of the questionnaire deals with your family background and your educational and employment experience. Please read the questions, select the appropriate response and fill in the number of your response in the corresponding blank on the answer sheet.

Example: In question 1, if your father is a teacher, fill in blank 6 on the answer sheet.

If none of the answers describe your father's occupation, fill in number 12, "Other".

---

1. Which of the following best describes the occupation of your father?

   1. Professional (doctor, lawyer, etc.)
   2. Executive or owner of private business
   3. Staff specialist or science (biologist, mathematician)
   4. Middle manager
   5. Small business owner
   6. Teacher
   7. Clerical or sales
   8. Supervisor
   9. Skilled worker
   10. Agriculture
   11. Semi- or unskilled worker
   12. Other

2. Is your father employed by:

   1. Government
   2. Large company
   3. Self
   4. Small company
   5. School or university
   6. Non-profit agency
   7. Other

3. Has your mother worked full time for wages or salary at any time since you were born?

   1. Yes
   2. No

If "No", omit questions 4 and 5.

4. Which of the following best describes the occupation of your mother?

1. Professional (doctor, lawyer, etc.)
2. Executive or owner of private business
3. Staff specialist or science (biologist, mathematician)
4. Middle manager
5. Small business owner
6. Teacher
7. Clerical or sales
8. Supervisor
9. Skilled worker
10. Agriculture
11. Semi- or unskilled worker
12. Other

5. Is your mother employed by:

1. Government
2. Large company
3. Self
4. Small company
5. School or university
6. Non-profit agency
7. Other

6. Describe your father's education:

1. Less than high school
2. Some high school
3. Completed high school
4. Some college
5. College degree
6. Graduate work

7. Describe your mother's education:

1. Less than high school
2. Some high school
3. Completed high school
4. Some college
5. College degree
6. Graduate work

8. How many older brothers and sisters do you have?
   Select the correct blank on the answer sheet which corresponds to the total number of older brothers and sisters you have.

   Example: If you have a total of three older sisters and brothers, you would mark blank 3 on the answer sheet.

9. How many younger brothers and sisters do you have?
   Select the correct blank on the answer sheet which corresponds to the total number of younger brothers and sisters you have.

10. What is your religious affiliation?

    1. Protestant
    2. Catholic
    3. Jewish
    4. None
    5. Other

11. Would you describe your religious practice as:

    1. Not at all religious
    2. Somewhat religious
    3. Very religious

12. How many years have you held full-time employment? (Do not count time spent in military, summer, or school year.)

    1. None
    2. 0 to 1 year
    3. 1 to 2 years
    4. 2 to 5 years
    5. Greater than 5 years

13. (Answer only if you held full-time employment, Question 12.)
    Were you employed by:

    1. Government
    2. Large company
    3. Self
    4. Small Company
    5. School or university
    6. Non-profit agency
    7. Other

14. Have you served in the armed forces?

    1. Yes

    2. No

PART II EDUCATIONAL EXPECTATIONS

15. From the general list of fields below, please select the item which best describes your undergraduate major field of study. If your major was unspecified mark "undecided" on the answer sheet. If your major field is unlisted, mark "Other" on the answer sheet.

a. Use the first set of numbers 1-9 under question 15 on the answer sheet.

1. Biology
2. Psychology
3. Sociology/Anthropology
4. Chemistry
5. Mathematics
6. Physics
7. Engineering
8. Economics
9. Business

b. Use the second set of numbers 1-9 under question 15 on the answer sheet.

1. History
2. Political Science
3. Philosophy
4. Art
5. Music
6. Foreign Language
7. English
8. Education
9. Physical Education

16. In which of the following fields of business are you specializing?

1. Managerial information and control - Accounting
2. Operations management - production control systems
3. Management information systems - computer science
4. Organizational studies - applied behavioral science
5. Industrial relations - personnel
6. Operations research - mathematical models
7. International management
8. Marketing
9. Finance
10. Managerial economics - business economics
11. Industrial dynamics
12. General management - business policy
13. Other

17. How long ago did you decide to pursue your current program of graduate study?

1. In high school
2. In freshman year of college
3. In sophomore year of college
4. In junior year of college
5. In senior year of college
6. After college graduation
7. After working

18. Do you plan to pursue a Ph.D?

    1. Yes
    2. No
    3. Undecided

19. How certain are you about your decision to pursue graduate study in this particular field?

    1. Many doubts
    2. Some doubts
    3. Certain
    4. Very certain
    5. Absolutely certain

20. How certain are you of your decision to enter this particular graduate school?

    1. Many doubts
    2. Some doubts
    3. Certain
    4. Very certain
    5. Absolutely certain

21. Below is a list of possible reasons for pursuing graduate study. On a 7-point scale please indicate the extent to which the statement is accurate in describing your thoughts and motivation to enter graduate school, where

    1 = not applicable,
    7 = very applicable

    a. A master's degree will raise my earnings potential.

    b. I am preparing for an academic career.

    c. I desire to gain the skills necessary to become more expert in a specific field of interest.

    d. Graduate study will be an important part of my career.

    e. I have a desire to learn about underlying disciplines in my particular field.

    f. I desire to learn the attitudes and values necessary to pursue my career.

g. I don't think you can do anything interesting with a bachelor's degree.

h. I don't really want more education, but I feel that I have to have it.

i. My family would be pleased if I were to enter graduate study.

22. Below is a list of possible strengths and weaknesses of educational institutions. On a 7-point scale indicate your perception of whether the characteristic was a positive or negative factor in your rating of your particular graduate school. Mark a 4 if the characteristic was not relevant in your ranking.

1 = Very negative
4 = Not relevant
7 = Very positive

a. Quantitative emphasis

b. Research opportunities

c. Qualitative emphasis

d. Strength in your specific field of interest

e. Social opportunities

f. Size of school

g. Opportunity for specialization

h. Prestige of school

i. Required courses

j. Case studies

k. Integrated program

l. Practical experience available

m. Location

n. Cost and financial aid offered

o. Faculty

p. Campus environment and facilities

q. Breadth of program

r. Type of student attending

s. Community involvement

23. Please indicate on a 7-point scale your expectations as to how much each of the following activities will contribute to your career objectives where,

1 = little contribution;
7 = great contribution

a. Problem solving or homework prepared outside of class

b. Independent reading

c. Independent research

d. Projects in industry

e. Summer or school year job in industry

f. Community projects

g. Extra-curricular activities

h. Outside lectures

i. Peer group interaction

j. Interaction with people from industry

k. Interaction with faculty

l. Research done with faculty member

m. Class discussions

n. Course lectures

o. Social activities

p. Course reading preparation

q. Group projects

r. Seminars

s. Laboratory experiences

24. On a 7-point scale indicate the amount of change in yourself that you expect to take place this year as a result of your present studies where,

1 = no change
7 = great change

a. Ability to analyze problems

b. Ability to apply techniques

c. Ability to formulate policy or goals

d. Ability to think creatively

e. Ability to formulate plans

f. Ability to communicate ideas

g. Ability to sell ideas to others

h. Ability to induce change

i. Ability to identify problems

j. Ability to work with people

k. Attitudes toward people

l. Ability to do research

m. Ability to make decisions

n. Knowledge of techniques

o. Willingness to take risks

p. Ability to recognize own abilities and limitations

q. Goals and aspirations for career

r. Knowledge of business principles

s. Personal attitudes and values

t. Attitudes towards business and industry

u. Self confidence

PLEASE TURN ANSWER SHEET TO PAGE 2, PART III, CAREER OBJECTIVES

PART III - CAREER OBJECTIVES

25. Where would you like to work on your first job?

1. Government
2. Large company
3. Self
4. Small company
5. University or school
6. Non-profit agency
7. Other

26. After 20 years where would you like to work?

1. Government
2. Large company
3. Self
4. Small company
5. School or university
6. Non-profit agency
7. Other

27. Indicate the salary range which you expect to earn on your first job.

1. Below $10,000
2. $10,000 - $15,000
3. $15,000 - $20,000
4. $20,000 - $30,000
5. $30,000 - $40,000
6. $40,000 - $50,000
7. Above $50,000

28. Indicate the salary range which you expect in twenty years.

1. Below $10,000
2. $10,000 - $15,000
3. $15,000 - $20,000
4. $20,000 - $30,000
5. $30,000 - $40,000
6. $40,000 - $50,000
7. $50,000 - $100,000
8. Above $100,000

29. People differ in what is important to them in a job. In this section we have listed a number of factors which people might want in their work. Please rate on a 7-point scale how important each of these factors is to you.

1 = of no importance
7 = of utmost importance

a. Have an opportunity for high earnings.

b. Have job security.

c. Have a job which leaves you sufficient time for your personal or family life.

d. Have a job which is highly regarded by others.

e. Have considerable freedom to adopt your own approach to the job.

f. Work in a department which is run efficiently.

g. Have training opportunities (to improve your skills or learn new skills).

h. Have a job which allows you to make a real contribution to the success of the company or institution.

i. Have good physical working conditions (ventilation,lighting, etc.)

j. Get the recognition you deserve when you do a good job.

k. Work for an organization with high prestige.

l. Have challenging work to do - work from which you can get a personal sense of accomplishment

m. Work in a department where the people are congenial and friendly to one another.

n. Have an opportunity for advancement to higher level jobs

o. Have a reasonable work load, one which is not excessive.

p. Have a job in which you can have much authority.

q. Have a job in which you have the opportunity to be helpful to others.

PART IV - SELF PERCEPTION

30. On the answer sheet are listed several sets of adjective scales which are frequently used to describe individuals. For each adjective pair, describe YOU AS YOU SEE YOURSELF by indicating the location on a 7-point scale where you picture yourself to be. If a pair of adjectives does not apply fill in a 4.

    Example: If you see yourself as being relatively relaxed, you might mark a 2 on the first item.

31. For each adjective pair (as in question 30) describe YOU AS YOU WOULD LIKE TO BE on the 7-point scale.

32. For each adjective pair (as in question 30) describe your perception of a TYPICAL BUSINESSMAN.

GO TO PAGE 3 OF YOUR ANSWER SHEET.

33. PERSONAL OPINION QUESTIONNAIRE III (Copyright 1962, Edgar H. Schein)

Below you will find a number of items dealing with various aspects of business management. Please indicate next to each item your degree of agreement or disagreement by writing the number 1, 2, 3, or 4.

1 means strong agreement

2 means mild agreement

3 means mild disagreement

4 means strong disagreement

Please try to be as frank as you can in giving your opinion. There are no right or wrong answers to any of the items. We are trying to find out how people feel about the issues which are described in the items.

If any item makes no sense to you at all, or you genuinely have no opinion about an issue, leave it blank. But please try to give answers to as many of the items as possible.

1. Governmentally operated projects cannot compete with private enterprise because they are less efficient.

2. Group decisions are generally more conservative than what the leader of the group would have done had he decided alone.

3. The man who gets ahead in industry is the man who has someone sponsoring him.

4. Most industrial problems can be attributed to a few basic causes.

5. Most workers in industry can be trusted enough to be allowed to set their own production goals.

6. Government should be headed by men trained in business techniques and sympathetic to the cause of business.

7. Most consumers' products manufactured today have been designed to last only a few years.

1 strong agreement
2 mild agreement
3 mild disagreement
4 strong disagreement

8. In industry there must always be unity of command so that individuals will not be subjected to conflicting authority.

9. The man who gets ahead in industry is the man who knows the right people.

10. Private enterprise working through a market economy provides the most equitable distribution of society's goods and services.

11. Proper advertising can sell virtually any product.

12. The best way to get ahead in business is to move from organization to organization.

13. Corporations have a definite obligation to take a stan on political issues.

14. The quality of individual decisions in generally higher than the quality of group decisions.

15. Resistance to change is industry's major problem.

16. The private life of an employee should be of no direct concern to his company.

17. The good manager must be willing to compromise his own ethics and morals to some degree in order to get his job done.

18. The most important objective of a company is to allow for the maximum development of its employees as individuals.

19. A corporation with a good public image can sell even an inferior product.

20. The average worker in industry is capable of exercising self-control.

21. The most important objective of a company is to provide its stockholders with as high a return on their investment as is possible.

22. Corporations have a definite obligation to support liberal arts colleges.

23. Most organizations would be more effective if they used committees to make some of their decisions.

1 strong agreement
2 mild agreement
3 mild disagreement
4 strong disagreement

24. The primary purpose of a training program for college graduates should be to indoctrinate them with the organization's basic philosophy, goals, and ways of doing things.

25. A small company is generally a more desirable employer than a large corporation because it offers greater opportunity for the individual to maximize his talents.

26. The good manager is willing to make decisions which will hurt others.

27. Corporations have a definite obligation to give money to charity.

28. Managers are not always sincere in their dealings with other people.

29. Nowadays it is more important for a manager to be loyal to his profession than to any given organization.

30. The engineer in industry should give his primary allegiance to the company he works for, not the engineering profession as such.

31. The best kind of emotional relationship between a superior and a subordinate is an open one in which each party feels it can "level" completely with the other.

32. Management will usually do what is best for its employees without outside influence from unions.

33. The one most important factor contributing to a manager's advancement is his ability to get along with people.

34. The human relations-group dynamics approach in industry tends to stifle the individuality of employees.

35. The average employee's standard of living would not be what it is today had it not been for the efforts of labor unions on his behalf.

36. A large corporation is generally a more desirable employer than a small company since it offers security, regular advancement, and a wider selection of jobs.

37. The good manager should disregard the feelings of others in making decisions.

1 strong agreement
2 mild agreement
3 mild disagreement
4 strong disagreement

38. Government competition with private enterprise is unfair and should be eliminated.

39. Piece work systems are bad for company morale since they force competition between fellow workers.

40. The good businessman is basically a cold, calculating kind of person.

41. Most corporations do not have clear objectives which can serve as guides to executive decisions.

42. Industry's basic idea is to drive you as hard as it can and give you as little as possible.

43. A young man entering industry should be careful in selecting a wife to make sure she will fit into his career plans.

44. The average worker in industry prefers to avoid responsibility, has little amibtion, and wants security above all.

45. Many employers think only of their profits and care little for their employees' welfare.

46. It is the tough, driving, impersonal man who really gets ahead in industry.

47. The "committee way of life" in an organization often results in a good bit of wasted time.

48. The successful manager is a "jack of all trades and master of none."

49. Piece work systems are good for company morale because they stimulate high productivity.

50. Constant change and innovation is basically a good thing for society and its institutions.

51. One of the major reasons for the existence of company pension plans is that they insure the loyalty of the older emplovees.

52. Responsibility should never exceed authority because the individual cannot be held responsible for what he does not control.

53. The legal system of this country is generally slanted against big business.

54. Nowadays when industry hires a new manager his whole family should be screened as an indication of his potential for advancement.

1 strong agreement
2 mild agreement
3 mild disagreement
4 strong disagreement

55. Management will usually do what is best for its employees without outside influence from the government.

56. Managers usually deal with people in a democratic manner.

57. A man who is willing to work hard in industry does not need a union to protect him.

58. The good manager should rely on explanation and persuasion rather than direct orders.

59. To succeed in business one must be able to take criticism without being hurt by it.

60. The private life of an employee is properly a matter of direct concern to his company, for the two can never be com letely segregated.

61. Most managers are delightful people to know socially.

62. A firm separation between staff and line functions is essential to efficient company performance.

63. Group incentive plans are superior to piece work systems in stimulating high productivity.

64. Most large corporations are placing more stress on the "corporation loyalty" of the employee than on his individual growth.

65. The most important objective of a company is to manufacture and sell products which are useful to society.

66. Managers often have to treat people unfairly to get their job done.

67. The man who gets ahead in industry is the man who knows how to "play politics."

68. Individual decisions cannot be as consistently sound as group decisions.

69. A corporation must be responsible for the health and welfare of its employees and their immediate families.

1 strong agreement
2 mild agreement
3 mild disagreement
4 strong disagreement

70. The one most important factor contributing to a manager's advancement is his ability to place the welfare of the company above that of his friends and colleagues.

71. The good manager should always be sensitive to the feelings of his subordinates.

72. Management is primarily a process of understanding and adapting to economic forces.

73. The more a young executive moves from job to job within a company, the greater will be his chance for success.

74. Many managers are suspicious of their business associates.

75. In business decisions, the human factor is usually more important than the economic factor.

76. Some degree of cynicism is a valuable attribute in a manager.

77. There are many sound principles of business which should not be changed even if economic and technological conditions change.

78. A wife's social grace and attractiveness play a significant role in her husband's rate of advancement.

79. The welfare of society is best achieved if all businesses pursue profit to the best of their ability.

80. A large corporation tends to suppress individual creativity.

81. "Price fixing," contract rigging, and other similar activities by leading American business firms show that the Federal Government must take a more active role in the policing of private enterprise.

82. Corporations have a definite obligation to be actively involved in community affairs.

83. A clearcut hierarchy of authority and responsibility is the cornerstone of the business organization.

84. Leadership skills can be acquired by most people, regardless of their particular inborn traits or abilities.

1 strong agreement
2 mild agreement
3 mild disagreement
4 strong disagreement

85. Religious teachings cannot be strictly observed in the business setting.

86. Present tax laws tend to stifle capital expansion by business more than they encourage it.

87. The average worker in industry has an inherent dislike to work and will avoid it if he can.

88. The successful manager is the one who becomes an expert in his own particular functions.

89. Large corporations create more opportunities than small companies for the individual to maximize his talents.

90. Strikes are usually caused by union leaders rather than rank-and-file members.

91. Most managerial jobs require a person to compromise his ethics or morals to some degree.

92. Compulsory arbitration should be instituted in vital industries such as the steel industry, to insure our country against work stoppages which jeopardize national defense.

93. It is the responsibility of business to insure that customers do not get inferior products.

94. The best way to get ahead in management is to have maximum experience in one field like finance, production, or marketing.

PLEASE RETURN ANSWER SHEETS AND QUESTIONNAIRE BOOKLET

IDENTIFICATION INFORMATION

STUDENT NUMBER

EDUCATIONAL LEVEL

1st yr. Master's
2nd yr. Master's
Ph.D.
Other
Part-time

SEX

M
F

AGE

THIS YEAR

1969
1970
1971
1972
1973
1974

DO NOT USE

MANAGEMENT OF UNIVERSITY EDUCATION RESEARCH
Alfred P. Sloan School of Management - Massachusetts Institute of Technology

PART I. BACKGROUND INFORMATION

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PART II. EDUCATIONAL EXPECTATIONS

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PLEASE TURN PAGE

UTILITY FORM 5877
OPTICAL SCANNING FORMS, INC. OPTICAL SCANNING CORPORATION

PAGE 1

PART III. CAREER OBJECTIVES

25. 1 2 3 4 5 6 7

26. 1 2 3 4 5 6 7

27. 1 2 3 4 5 6 7

28. 1 2 3 4 5 6 7 8

29a. 1 2 3 4 5 6 7

b. 1 2 3 4 5 6 7

c. 1 2 3 4 5 6 7

d. 1 2 3 4 5 6 7

e. 1 2 3 4 5 6 7

f. 1 2 3 4 5 6 7

g. 1 2 3 4 5 6 7

h. 1 2 3 4 5 6 7

i. 1 2 3 4 5 6 7

j. 1 2 3 4 5 6 7

k. 1 2 3 4 5 6 7

l. 1 2 3 4 5 6 7

m. 1 2 3 4 5 6 7

n. 1 2 3 4 5 6 7

o. 1 2 3 4 5 6 7

p. 1 2 3 4 5 6 7

q. 1 2 3 4 5 6 7

PART IV. SELF PERCEPTION

Please describe:

	30. YOU AS YOU SEE YOURSELF		31. YOU AS YOU WOULD LIKE TO BE	32. A TYPICAL BUSINESSMAN
Relaxed	1 2 3 4 5 6 7	Anxious	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Competitive	1 2 3 4 5 6 7	Non-competitive	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Lacks confidence	1 2 3 4 5 6 7	Confident	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Not cynical	1 2 3 4 5 6 7	Cynical	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Efficient	1 2 3 4 5 6 7	Inefficient	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Inflexible	1 2 3 4 5 6 7	Flexible	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Guarded	1 2 3 4 5 6 7	Frank	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Unenthusiastic	1 2 3 4 5 6 7	Enthusiastic	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Soft	1 2 3 4 5 6 7	Hard	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Inhibited	1 2 3 4 5 6 7	Uninhibited	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Subjective	1 2 3 4 5 6 7	Objective	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Patient	1 2 3 4 5 6 7	Impatient	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Impersonal	1 2 3 4 5 6 7	Personal	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Idealistic	1 2 3 4 5 6 7	Realistic	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Insensitive	1 2 3 4 5 6 7	Sensitive	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Insincere	1 2 3 4 5 6 7	Sincere	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Awkward	1 2 3 4 5 6 7	Poised	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Cooperative	1 2 3 4 5 6 7	Uncooperative	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Cautious	1 2 3 4 5 6 7	Daring	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Easily influenced	1 2 3 4 5 6 7	Mind of own	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Feels inferior	1 2 3 4 5 6 7	Feels superior	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Follows	1 2 3 4 5 6 7	Leads	1 2 3 4 5 6 7	1 2 3 4 5 6 7

UTILITY FORM 5878
OPTICAL SCANNING FORMS by OPTICAL SCANNING CORPORATION

PAGE 2

PART IV. SELF PERCEPTION CONTINUED

Please describe:	30. YOU AS YOU SEE YOURSELF		31. YOU AS YOU WOULD LIKE TO BE	32. A TYPICAL BUSINESSMAN
Emotional	1 2 3 4 5 6 7	Unemotional	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Friendly	1 2 3 4 5 6 7	Unfriendly	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Humble	1 2 3 4 5 6 7	Proud	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Mature	1 2 3 4 5 6 7	Immature	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Unoriginal	1 2 3 4 5 6 7	Original	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Tolerant	1 2 3 4 5 6 7	Prejudiced	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Satisfied	1 2 3 4 5 6 7	Dissatisfied	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Tactful	1 2 3 4 5 6 7	Tactless	1 2 3 4 5 6 7	1 2 3 4 5 6 7

MANAGEMENT OF UNIVERSITY EDUCATION RESEARCH
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Massachusetts Institute of Technology

33. PERSONAL OPINION QUESTIONNAIRE

1 = strong agreement
2 = mild agreement
3 = mild disagreement
4 = strong disagreement

1. 1 2 3 4	17. 1 2 3 4	33. 1 2 3 4	49. 1 2 3 4	65. 1 2 3 4	81. 1 2 3 4
2. 1 2 3 4	18. 1 2 3 4	34. 1 2 3 4	50. 1 2 3 4	66. 1 2 3 4	82. 1 2 3 4
3. 1 2 3 4	19. 1 2 3 4	35. 1 2 3 4	51. 1 2 3 4	67. 1 2 3 4	83. 1 2 3 4
4. 1 2 3 4	20. 1 2 3 4	36. 1 2 3 4	52. 1 2 3 4	68. 1 2 3 4	84. 1 2 3 4
5. 1 2 3 4	21. 1 2 3 4	37. 1 2 3 4	53. 1 2 3 4	69. 1 2 3 4	85. 1 2 3 4
6. 1 2 3 4	22. 1 2 3 4	38. 1 2 3 4	54. 1 2 3 4	70. 1 2 3 4	86. 1 2 3 4
7. 1 2 3 4	23. 1 2 3 4	39. 1 2 3 4	55. 1 2 3 4	71. 1 2 3 4	87. 1 2 3 4
8. 1 2 3 4	24. 1 2 3 4	40. 1 2 3 4	56. 1 2 3 4	72. 1 2 3 4	88. 1 2 3 4
9. 1 2 3 4	25. 1 2 3 4	41. 1 2 3 4	57. 1 2 3 4	73. 1 2 3 4	89. 1 2 3 4
10. 1 2 3 4	26. 1 2 3 4	42. 1 2 3 4	58. 1 2 3 4	74. 1 2 3 4	90. 1 2 3 4
11. 1 2 3 4	27. 1 2 3 4	43. 1 2 3 4	59. 1 2 3 4	75. 1 2 3 4	91. 1 2 3 4
12. 1 2 3 4	28. 1 2 3 4	44. 1 2 3 4	60. 1 2 3 4	76. 1 2 3 4	92. 1 2 3 4
13. 1 2 3 4	29. 1 2 3 4	45. 1 2 3 4	61. 1 2 3 4	77. 1 2 3 4	93. 1 2 3 4
14. 1 2 3 4	30. 1 2 3 4	46. 1 2 3 4	62. 1 2 3 4	78. 1 2 3 4	94. 1 2 3 4
15. 1 2 3 4	31. 1 2 3 4	47. 1 2 3 4	63. 1 2 3 4	79. 1 2 3 4	
16. 1 2 3 4	32. 1 2 3 4	48. 1 2 3 4	64. 1 2 3 4	80. 1 2 3 4	

PLEASE RETURN BOTH ANSWER SHEETS AND QUESTIONNAIRE BOOKLET

PAGE 3

UTILITY FORM 5879 OPTICAL SCANNING FORMS BY OPTICAL SCANNING CORPORATION

Student Course Evaluation Questionnaire

IDENTIFICATION INFORMATION

STUDENT NUMBER

COURSE NUMBER

SECTION

DATE

JAN - 69 JUL - 70
FEB - AUG - 71
MAR - SEP - 72
APR - OCT - 73
MAY - NOV - 74
JUN - DEC -

DO NOT USE

Indicate on a seven point scale the amount of change in yourself that took place as a specific result of this course. (1 = no change, 7 = much change)

Ability to analyze problems	1	2	3	4	5	6	7	Ability to do research	1	2	3	4	5	6	7
Ability to apply techniques	1	2	3	4	5	6	7	Ability to make decisions	1	2	3	4	5	6	7
Ability to formulate policy	1	2	3	4	5	6	7	Knowledge of management techniques	1	2	3	4	5	6	7
Ability to think creatively	1	2	3	4	5	6	7	Willingness to take risks	1	2	3	4	5	6	7
Ability to communicate ideas	1	2	3	4	5	6	7	Understanding own abilities and limitations	1	2	3	4	5	6	7
Ability to sell ideas	1	2	3	4	5	6	7	Goals and aspirations for own career	1	2	3	4	5	6	7
Ability to induce change	1	2	3	4	5	6	7	Knowledge of business principles	1	2	3	4	5	6	7
Ability to identify problems	1	2	3	4	5	6	7	Personal attitudes and values	1	2	3	4	5	6	7
Ability to work with people	1	2	3	4	5	6	7	Attitudes toward business	1	2	3	4	5	6	7
Attitudes toward people	1	2	3	4	5	6	7	Self confidence	1	2	3	4	5	6	7

On a seven point scale, check the extent to which each item applies to this course. (1 = does not apply, 7 = applies very much)

Professor pressures students to get work in	1	2	3	4	5	6	7	Professor gives students detailed comments about work	1	2	3	4	5	6	7
Professor is always criticizing students	1	2	3	4	5	6	7	Professor is well prepared for class	1	2	3	4	5	6	7
Students know when professor is pleased with their work	1	2	3	4	5	6	7	Professor gives clear explanations of material	1	2	3	4	5	6	7
Professor has a clear plan for semester's work	1	2	3	4	5	6	7	Texts and class sessions are well integrated	1	2	3	4	5	6	7
Material is too advanced for your level of understanding	1	2	3	4	5	6	7	Professor makes material relevant	1	2	3	4	5	6	7
Class sessions are always interesting	1	2	3	4	5	6	7	Professor motivates students' interest in the material	1	2	3	4	5	6	7
Students work on real world problems	1	2	3	4	5	6	7	The course will be directly applicable to the job	1	2	3	4	5	6	7
Professor forces students to re-evaluate their thinking	1	2	3	4	5	6	7	Professor encourages students to evaluate others' ideas	1	2	3	4	5	6	7
Professor conducts class as a lecture	1	2	3	4	5	6	7	Students are allowed to work at their own pace	1	2	3	4	5	6	7
Professor is willing to adapt to meet student needs	1	2	3	4	5	6	7	Students are encouraged to work on their own topics	1	2	3	4	5	6	7
Professor encourages student reactions to the course	1	2	3	4	5	6	7	Professor is available for outside assistance	1	2	3	4	5	6	7
Professor places a great deal of emphasis upon grades	1	2	3	4	5	6	7	Professor offers new approaches and ideas	1	2	3	4	5	6	7
Course is highly structured	1	2	3	4	5	6	7	The material is seldom fully covered	1	2	3	4	5	6	7

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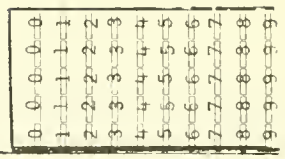
OPTICAL SCANNING FORMS BY OPTICAL SCANNING CORPORATION

Professor emphasizes the applied versus the theoretical 1 2 3 4 5 6 7

Professor stimulates students to think about issues 1 2 3 4 5 6 7

Student is forced to integrate material for himself 1 2 3 4 5 6 7



Time spent on course outside class averaged about 1 2 3 4
1. Less than 5 hours per week
2. 5 to 10 hours per week
3. 10 to 15 hours per week
4. More than 15 hours per week

The work load was 1 2 3 4
1. Light
2. Moderate
3. Heavy
4. Excessive

Scope of course was 1 2 3 4
1. Insufficient for one term
2. Adequate
3. Somewhat excessive for term
4. Too much for one term

Would "Basic" and "Advanced" sections of course be valuable? 1 2 3 4
1. Of no value
2. Of little value
3. Of some value
4. Of great value

If 2 sections were available which would you choose? 1 2 3 4
1. Advanced
2. Probably advanced
3. Probably basic
4. Basic

Course content was 1 2 3 4
1. Ahead of the times
2. Abreast of the times
3. Somewhat outdated
4. Completely outdated

Texts in course were 1 2 3 4
1. Poor
2. Fair
3. Good
4. Excellent

Other assigned readings were 1 2 3 4
1. Poor
2. Fair
3. Good
4. Excellent

Size of class was 1 2 3 4
1. Small
2. Moderate
3. Large
4. Too large

This course should 1 2 3 4
1. Be required of all students
2. Be waived in special cases
3. Be waived on liberal basis
4. Be an elective

Would you take course if not required? 1 2 3 4
1. Definitely yes
2. Probably yes
3. Probably no
4. Definitely no

Grading of course was 1 2 3 4
1. Very lenient
2. Lenient
3. Hard
4. Very hard

Using the adjective scales below, describe the professor in this course.

Relaxed	1 2 3 4 5 6 7	Anxious	
Competitive	1 2 3 4 5 6 7	Non-competitive	
Lacks confidence	1 2 3 4 5 6 7	Confident	
Not cynical	1 2 3 4 5 6 7	Cynical	
Efficient	1 2 3 4 5 6 7	Inefficient	
Inflexible	1 2 3 4 5 6 7	Flexible	
Guarded	1 2 3 4 5 6 7	Frank	
Unenthusiastic	1 2 3 4 5 6 7	Enthusiastic	
Soft	1 2 3 4 5 6 7	Hard	
Inhibited	1 2 3 4 5 6 7	Uninhibited	
Subjective	1 2 3 4 5 6 7	Objective	
Patient	1 2 3 4 5 6 7	Impatient	
Impersonal	1 2 3 4 5 6 7	Personal	
Idealistic	1 2 3 4 5 6 7	Realistic	
Insensitive	1 2 3 4 5 6 7	Sensitive	
Insincere	1 2 3 4 5 6 7	Sincere	
Awkward	1 2 3 4 5 6 7	Poised	
Cooperative	1 2 3 4 5 6 7	Uncooperative	
Cautious	1 2 3 4 5 6 7	Daring	
Easily influenced	1 2 3 4 5 6 7	Mind of own	
Feels inferior	1 2 3 4 5 6 7	Feel superior	
Follows	1 2 3 4 5 6 7	Leads	
Emotional	1 2 3 4 5 6 7	Unemotional	
Friendly	1 2 3 4 5 6 7	Unfriendly	
Humble	1 2 3 4 5 6 7	Proud	
Mature	1 2 3 4 5 6 7	Immature	
Unoriginal	1 2 3 4 5 6 7	Original	
Optimistic	1 2 3 4 5 6 7	Pessimistic	
Tolerant	1 2 3 4 5 6 7	Prejudiced	
Satisfied	1 2 3 4 5 6 7	Dissatisfied	
Tactful	1 2 3 4 5 6 7	Tactless	

UTILITY FORM 6328

OPTICAL SCANNING FORMS by OPTICAL SCANNING CORPORATION

ADDITIONAL COMMENTS AND SUGGESTIONS

These questions are the result of faculty and student suggestions. If you have comments about these questionnaires or suggestions for improvement, please write them on the reverse side of this sheet.

1. How useful will this course be to you in the future compared with other courses? (circle one)
   1. Much less useful
   2. Of average usefullness
   3. Much more useful

2. Was the homework relevant to class sessions in this course? (Circle one)
   1. Always relevant
   2. Sometimes relevant
   3. Seldom relevant
   4. Never relevant

3. Would you recommend this course to another student? (Circle one)
   1. Discourage
   2. Indifferent
   3. Strongly recommend

4. If there was a teaching assistant in this course, do you have any comments or suggestions you would like to direct to him?

5. Are there any additional comments you wish to make about this course (positive/negative aspects, suggestions for improvement, etc.)? Please use the reverse side of this sheet for your comments.

Course Number 15. __ __ __ Professor_____

Graduate School Questionnaires - Faculty Questionnaires

The Professor Pre-Course Questionnaire

IDENTIFICATION INFORMATION

SOCIAL SECURITY NUMBER

SECTION

COURSE NUMBER

DATE

MONTH: JAN = 1, FEB = 2, MAR = 3, APR = 4, MAY = 5, JUN = 6, JUL = 7, AUG = 8, SEP = 9, OCT = 10, NOV = 11, DEC = 12

YEAR: 69, 70, 71, 72, 73, 74

DO NOT USE

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Alfred P. Sloan School of Management
Massachusetts Institute of Technology

1 What ar the underlying disciplines upon which this course is based? Please indicate the degree of emphasis where 1 = no emphasis, 7 = much emphasis.

Economics	1 2 3 4 5 6 7	Information & Control Theory	1 2 3 4 5 6 7
Psychology	1 2 3 4 5 6 7	Sociology	1 2 3 4 5 6 7
Mathematics	1 2 3 4 5 6 7	Information Technology	1 2 3 4 5 6 7

2. How would you describe the focus of this course? Please indicate the degree of emphasis on the items below on a seven-point scale where 1 = little emphasis and 7 = much emphasis.

INTERNAL MANAGEMENT FUNCTIONS

Finance	1 2 3 4 5 6 7	Production	1 2 3 4 5 6 7
Information Systems	1 2 3 4 5 6 7	Research & Development	1 2 3 4 5 6 7
Industrial Relations	1 2 3 4 5 6 7	Planning & Control	1 2 3 4 5 6 7
Marketing	1 2 3 4 5 6 7	Organizational Development	1 2 3 4 5 6 7
Interpersonal Relations	1 2 3 4 5 6 7		

FRAMEWORK FOR ANALYSIS

Organizational Viewpoint	1 2 3 4 5 6 7	Legal Viewpoint	1 2 3 4 5 6 7
Economic Viewpoint	1 2 3 4 5 6 7	Specific Functional Viewpoint	1 2 3 4 5 6 7

PROCESSES IN EXTERNAL ENVIRONMENT

Customer Behavior	1 2 3 4 5 6 7	Economic, Social & Political Change	1 2 3 4 5 6 7
Communication	1 2 3 4 5 6 7	Legislation	1 2 3 4 5 6 7
Distribution & Transportation	1 2 3 4 5 6 7		

EXTERNAL GROUPS & INSTITUTIONS

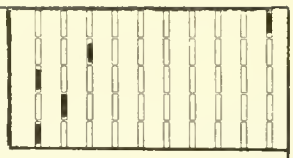
Capital Sources	1 2 3 4 5 6 7	State Government	1 2 3 4 5 6 7
Competitive Industry Groups	1 2 3 4 5 6 7	Federal Government	1 2 3 4 5 6 7
Trade Groups	1 2 3 4 5 6 7	International Organizations	1 2 3 4 5 6 7
Consumers	1 2 3 4 5 6 7	Stockholders	1 2 3 4 5 6 7
Community	1 2 3 4 5 6 7	Unions	1 2 3 4 5 6 7
Local Government	1 2 3 4 5 6 7		

PLEASE TURN PAGE

UTILITY FORM 5873
OPTICAL SCANNING FORMS BY OPTICAL SCANNING CORPORATION

EXTERNAL VIEWPOINT

Organizational Structure	1 2 3 4 5 6 7	Economic Structure	1 2 3 4 5 6 7
Political Structure	1 2 3 4 5 6 7	Social Structure	1 2 3 4 5 6 7



DEGREE OF EMPHASIS UPON:

Theory	1 2 3 4 5 6 7	Specific Skill Development	1 2 3 4 5 6 7
Application	1 2 3 4 5 6 7	Qualitative Approaches	1 2 3 4 5 6 7
Subject Overview	1 2 3 4 5 6 7	Quantitative Approach	1 2 3 4 5 6 7

3. In teaching this course, to what extent will you attempt to:
[1 = not at all, 7 = very much]

Develop the student's experience in:

Application of Techniques	1 2 3 4 5 6 7
Policy Formulation	1 2 3 4 5 6 7
Creative Thinking	1 2 3 4 5 6 7
Planning	1 2 3 4 5 6 7
Evaluating Decisions	1 2 3 4 5 6 7
Communicating	1 2 3 4 5 6 7
Selling Ideas	1 2 3 4 5 6 7
Doing Research	1 2 3 4 5 6 7
Inducing Change	1 2 3 4 5 6 7
Problem Finding	1 2 3 4 5 6 7
Problem Solving	1 2 3 4 5 6 7
Working with People	1 2 3 4 5 6 7
Decision Making	1 2 3 4 5 6 7
Risk Taking	1 2 3 4 5 6 7

Develop the student's awareness of:

Own Abilities & Limitations	1 2 3 4 5 6 7
Career Objectives	1 2 3 4 5 6 7
Self Confidence	1 2 3 4 5 6 7

Bring about change in:

Personal Attitudes & Values	1 2 3 4 5 6 7
Desire for Continued Learning	1 2 3 4 5 6 7
Attitudes toward Business and Industry	1 2 3 4 5 6 7
Attitudes toward People	1 2 3 4 5 6 7

4. Please indicate the relative emphasis you plan to give the learning mechanisms below, where 1 = no emphasis and 7 = much emphasis

Problem Solving	1 2 3 4 5 6 7
Case Studies	1 2 3 4 5 6 7
Independent Research Papers	1 2 3 4 5 6 7
Projects in Industry	1 2 3 4 5 6 7
Visiting Lecturers	1 2 3 4 5 6 7
Student Interaction Outside Class	1 2 3 4 5 6 7
Class Discussions	1 2 3 4 5 6 7
Student Interaction with People from Industry	1 2 3 4 5 6 7
Class Lectures	1 2 3 4 5 6 7
Student-Faculty Interaction	1 2 3 4 5 6 7
Group Projects	1 2 3 4 5 6 7
Simulated Experiences	1 2 3 4 5 6 7
Library Research Papers	1 2 3 4 5 6 7
Short Papers Analyzing Course Material	1 2 3 4 5 6 7

5. What portion of course content will be determined by student interest? 1 2 3 4 5

1. None
2. 1/4
3. 1/2
4. 3/4
5. All

6. How much time will the average student spend preparing for this class per week? 1 2 3 4

1. Less than 5 hours
2. 5 - 10 hours
3. 10 - 15 hours
4. Over 15 hours

UTILITY FORM 5874
OPTICAL SCANNING FORMS by OPTICAL SCANNING CORPORATION

The Professor Post-Course Questionnaire

MANAGEMENT OF UNIVERSITY EDUCATION RESEARCH
Alfred P. Sloan School of Management - Massachusetts Institute of Technology

IDENTIFICATION INFORMATION

SOCIAL SECURITY NUMBER

SECTION

COURSE NUMBER

DATE

MONTH: JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

YEAR: 69 70 71 72 73 74

DO NOT USE

In teaching this course, to what extent did you attempt to: [1=not at all; 7 = very much]

DEVELOP STUDENT EXPERIENCE IN:

- Application of Techniques 1 2 3 4 5 6 7
- Policy Formulation 1 2 3 4 5 6 7
- Creative Thinking 1 2 3 4 5 6 7
- Planning 1 2 3 4 5 6 7
- Evaluating Decisions 1 2 3 4 5 6 7
- Communicating 1 2 3 4 5 6 7
- Selling Ideas 1 2 3 4 5 6 7
- Doing Research 1 2 3 4 5 6 7
- Inducing Change 1 2 3 4 5 6 7
- Problem Finding 1 2 3 4 5 6 7
- Problem Solving 1 2 3 4 5 6 7
- Working with People 1 2 3 4 5 6 7
- Decision Making 1 2 3 4 5 6 7
- Risk Taking 1 2 3 4 5 6 7

DEVELOP THE STUDENT'S AWARENESS OF:

- Own Abilities and Limitations 1 2 3 4 5 6 7
- Career Objectives 1 2 3 4 5 6 7
- Self Confidence 1 2 3 4 5 6 7

BRING ABOUT CHANGE IN:

- Personal Attitudes and Values 1 2 3 4 5 6 7
- Desire for Continued Learning 1 2 3 4 5 6 7
- Attitudes toward Business 1 2 3 4 5 6 7
- Attitudes toward People 1 2 3 4 5 6 7

Please indicate the relative emphasis you gave to the learning mechanisms below, where 1 = no emphasis, 7 = much emphasis.

- Student-Faculty Interaction 1 2 3 4 5 6 7
- Case Studies 1 2 3 4 5 6 7
- Independent Research Papers 1 2 3 4 5 6 7
- Projects in Industry 1 2 3 4 5 6 7
- Visiting Lecturers 1 2 3 4 5 6 7
- Student Interaction Outside Class 1 2 3 4 5 6 7
- Class Discussions 1 2 3 4 5 6 7
- Student Interaction with People from Industry 1 2 3 4 5 6 7
- Class Lectures 1 2 3 4 5 6 7
- Student-Faculty Interaction 1 2 3 4 5 6 7
- Group Projects 1 2 3 4 5 6 7
- Simulated Experiences 1 2 3 4 5 6 7
- Library Research Papers 1 2 3 4 5 6 7
- Short Papers Analyzing Course Material 1 2 3 4 5 6 7

What portion of course content was determined by student interest? ☐ None ☐ 1/4 ☐ 1/2 ☐ 3/4 ☐ All

Did you use any of the following technological aids in your course? For what purpose? Please fill in the appropriate boxes.

☐ Slides or film	☐ as lecture supplement	☐ medium for discussion	☐ student critique	☐ actual lecture
☐ Video-tape	☐ as lecture supplement	☐ medium for discussion	☐ student critique	☐ actual lecture
☐ Television	☐ as lecture supplement	☐ medium for discussion	☐ student critique	☐ actual lecture

☐ Computer ☐ Time Sharing ☐ Batch Processing

☐ Aid in group problem solving ☐ Demonstration in class ☐ Data analysis ☐ Programmed learning

UTILITY FORM 6361 OPTICAL SCANNING FORMS BY OPTICAL SCANNING CORPORATION

Undergraduate School Questionnaires

The Pre Term Questionnaire Booklet

and Answer Sheet*

*The Post Term Questionnaire is simply a pasttense version of the Pre Term Questionnaire with the ommission of Part I of the questionnaire, which deals with personal background information.

MANAGEMENT OF UNIVERSITY EDUCATION RESEARCH

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Alfred P. Sloan School of Management

50 Memorial Drive

Cambridge, Massachusetts 02139

UNDERGRADUATE
PRE-TERM QUESTIONNAIRE BOOKLET

---

1. You should have <u>two</u> separate answer sheets to use with this booklet.

2. Please fill in the "Identification Information" such as your student identification number, age, sex, and other requested information in the identification section of the questionnaire.

3. Read the instructions for <u>each question</u> very carefully - they change from question to question.

4. Use a soft lead pencil (Number 2) to record your answers on the sheet by completely filling in the appropriate blank.

5. If you change your mind, erase the first mark <u>completely</u> and make a new mark. Make only one mark for each question.

Part I

This section of the questionnaire deals with your family background, and your educational and employment experience. Please read the questions, select the appropriate response and fill in the number of your response in the corresponding blank on the answer sheet.

Example: In question 1, if your father is a teacher, fill in blank 6 on the answer sheet.

If none of the answers describe your father's occupation, fill in number 12, "Other".

---

1. Which of the following best describes the occupation of your father?

   1. Professional (doctor, lawyer, etc.)
   2. Executive or owner of private business
   3. Staff specialist or science (biologist, mathematician)
   4. Middle manager
   5. Small business owner
   6. Teacher
   7. Clerical or sales
   8. Supervisor
   9. Skilled worker
   10. Agriculture
   11. Semi- or unskilled worker
   12. Other

2. Is your father employed by:

   1. Government
   2. Large company
   3. Self
   4. Small company
   5. School or university
   6. Non-profit agency
   7. Other

3. Has your mother worked full time for wages or salary at any time since you were born?

   1. Yes
   2. No

If your answer to question 3 is "No", omit questions 4 and 5.

4. Which of the following best describes the occupation of your mother?

1. Professional (doctor, lawyer, etc.)
2. Executive or owner of private business
3. Staff specialist or science (biologist, mathematician)
4. Middle Manager
5. Small business owner
6. Teacher
7. Clerical or sales
8. Supervisor
9. Skilled worker
10. Agriculture
11. Semi- or unskilled worker
12. Other

5. Is your mother employed by:

1. Government
2. Large company
3. Self
4. Small company
5. School or university
6. Non-profit agency
7. Other

6. Describe your father's education:

1. Less than high school
2. Some high school
3. Completed high school
4. Some college
5. College degree
6. Graduate work

7. Describe your mother's education:

1. Less than high school
2. Some high school
3. Completed high school
4. Some college
5. College degree
6. Graduate work

8. How many older brothers and sisters do you have?
   Select the correct blank on the answer sheet which corresponds to the total number of older brothers and sisters you have.

   Example: If you have a total of three older sisters and brothers, you would mark blank 3 on the answer sheet.

9. How many younger brothers and sisters do you have?
   Select the correct blank on the answer sheet which corresponds to the total number of younger brothers and sisters you have.

10. What is your religious affiliation?

    1. Protestant
    2. Catholic
    3. Jewish
    4. None
    5. Other

11. Would you describe your religious practice as:

    1. Not at all religious
    2. Somewhat religious
    3. Very religious

12. How many years have you held full-time employment? (Do not count time spent in military, summer, or school year.)

    1. None
    2. 0 to 1 year
    3. 1 to 2 years
    4. 2 to 5 years
    5. Greater than 5 years

13. Have you served in the armed forces?

    1. Yes
    2. No

Part II - Educational Expectations

14. Below is a list of possible strengths and weaknesses of educational institutions. On a 7-point scale indicate whether the characteristic was important or unimportant in your choice of your particular school. Mark 4 if the characteristic is not relevant in your ranking.

1 = of no importance
7 = of utmost importance

a. Quantitative emphasis

b. Research opportunities

c. Qualitative emphasis

d. Strength in a specific field of interest

e. Social opportunities

f. Size of school

g. Opportunity for specialization

h. Prestige of school

i. Required courses

j. Case studies

k. Integrated program

l. Practical experience available

m. Location

n. Cost and financial aid offered

o. Faculty

p. Campus environment and facilities

q. Breadth of program

r. Type of student attending

s. Community involvement

15. Please indicate on a 7-point scale your expectations as to how much each of the following activities will contribute to your career objectives, where:

    1 = little contribution
    7 = great contribution

a. Problem solving or homework prepared outside of class

b. Independent reading

c. Independent research

d. Projects in industry

e. Summer or school year job in industry

f. Community projects

g. Extra-curricular activities

h. Outside lectures

i. Peer group interaction

j. Interaction with people from industry

k. Interaction with faculty

l. Research done with faculty member

m. Class discussions

n. Course lectures

o. Social activities

p. Course reading preparation

q. Group projects

r. Seminars

s. Laboratory experiences

16. On a 7-point scale indicate the amount of change in yourself that you would like to take place this year as a result of your present studies, where

    1 = no change
    7 = great change

    a. Ability to analyze problems

    b. Ability to apply techniques

    c. Ability to formulate policy or goals

    d. Ability to think creatively

    e. Ability to formulate plans

    f. Ability to communicate ideas

    g. Ability to sell ideas to others

    h. Ability to induce change

    i. Ability to identify problems

    j. Ability to work with people

    k. Attitudes toward people

    l. Ability to do research

    m. Ability to make decisions

    n. Knowledge of techniques

    o. Willingness to take risks

    p. Ability to recognize own abilities and limitations

    q. Goals and aspirations for career

    r. Knowledge of business principles

    s. Personal attitudes and values

    t. Attitudes towards business and industry

    u. Self confidence

17. From the 2 general lists of fields below, please select the item which best describes your major field of study. If you are still uncertain mark "undecided" on the answer sheet. If your major field is not listed, mark "other" on the answer sheet.

a. (Use the first set of numbers 1-9 under question 17 on the answer sheet.)

1. Biology
2. Psychology
3. Sociology/Anthropology
4. Chemistry
5. Mathematics
6. Physics
7. Engineering
8. Economics
9. Business

b. (Use the second set of numbers 1-9 under question 17 on the answer sheet.)

1. History
2. Political Science
3. Philosophy
4. Art
5. Music
6. Foreign language
7. English
8. Education
9. Physical Education

18. Do you plan to pursue graduate study at the master's degree level?

    1. Yes
    2. No
    3. Undecided

19. Do you plan to pursue graduate study at the Ph.D. level?

    1. Yes
    2. No
    3. Undecided

If you answered "Yes" to questions 18 or 19 please complete questions 20 and 21.

20. From the general list of fields below, please select the number which best describes the field you would like to pursue in graduate study. If you are uncertain, mark "Undecided" on your answer sheet. If your field is not listed mark "Other" on the answer sheet.

    a. (Use the first set of numbers 1-9 under question 17 on the answer sheet.)

       1. Biology

       2. Psychology

       3. Sociology/Anthropology

       4. Chemistry

       5. Mathematics

       6. Physics

       7. Engineering

       8. Economics

       9. Business

    b. (Use the second set of numbers 1-9 under question 17 on the answer sheet).

       1. History

       2. Political Science

       3. Philosophy

       4. Art

       5. Law

6. Foreign language

7. English

8. Education

9. Medicine

21. Below is a list of possible reasons for pursuing graduate study. On a 7 - point scale please indicate the extent to which the statement is accurate in describing your thoughts and motivation to enter graduate school, where

1 = not applicable;
7 = very applicable

a. A master's degree will raise my earnings potential.

b. I am preparing for an academic career.

c. I desire to gain the skills necessary to become more expert in a specific field of interest.

d. Graduate study will be an important part of my career.

e. I have a desire to learn about underlying disciplines in my particular field.

f. I desire to learn the attitudes and values necessary to pursue my career.

g. I don't think you can do anything interesting with a bachelor's degree.

h. I don't really want more education, but I feel that I have to have it.

i. My family would be pleased if I were to enter graduate study.

TURN ANSWER SHEET OVER TO PAGE 2, PART III, CAREER OBJECTIVES

Part III - Career Objectives

22. Where would you like to work on your first job?

1. Government
2. Large company
3. Self
4. Small company
5. Education
6. Non-profit agency
7. Other

23. After 20 years where would you like to work?

1. Government
2. Large company
3. Self
4. Small company
5. Education
6. Non-profit agency
7. Other

24. (For women only) After graduation do you expect to be working

1. Part-time
2. Full-time
3. Not at all

25. (For women only) In 20 years do you expect to be working

1. Part-time
2. Full-time
3. Not at all

26. Indicate the yearly salary range which you expect to earn on your first job.

1. Below $5,000
2. $5,000 - $10,000
3. $10,000 - $15,000
4. $15,000 - $20,000
5. $20,000 - $30,000
6. Above $30,000

27. Indicate the yearly salary range which you expect in twenty years.

1. Below $5,000
2. $5,000 - $10,000
3. $10,000 - $15,000
4. $15,000 - $20,000
5. $20,000 - $30,000
6. $30,000 - $40,000
7. $40,000 - $50,000
8. $50,000 - $100,000
9. Above $100,000

28. (For women only) If a woman had a choice among the following ways of life, which do you think she would find the most satisfying?

1. Being a career woman
2. Combining a family and a career
3. Having a family and working part-time
4. Having a family and working at home
5. Having a family and participating in volunteer activities
6. Having a family and devoting all of her time to them

29. People differ in what is important to them in a job. In this section we have listed a number of factors which people might want in their work. Please rate on a 7-point scale how important each of these factors is to you.

1 = of no importance
7 = of utmost importance

a. Have an opportunity for high earnings.

b. Have job security.

c. Have a job which leaves you sufficient time for your personal or family life.

d. Have a job which is regarded highly by others.

e. Have considerable freedom to adopt your own approach to the job.

f. Work in a department which is run efficiently.

g. Have training opportunities (to improve your skills or learn new skills).

h. Have a job which allows you to make a real contribution to the success of the company or institution.

i. Have good physical working conditions (ventilation, lighting, etc.)

j. Get the recognition you deserve when you do a good job.

k. Work for an organization with high prestige.

l. Have challenging work to do - work from which you can get a personal sense of accomplishment.

m. Work in a department where the people are congenial and friendly to one another.

n. Have an opportunity for advancement to higher level jobs.

o. Have a reasonable work-load, one which is not excessive.

p. Have a job in which you can have much authority.

q. Have a job in which you have the opportunity to be helpful to others.

Part IV - Self Perception

30. On the answer sheet are listed several sets of adjective scales which are frequently used to describe individuals. For each adjective pair, describe YOU AS YOU SEE YOURSELF by indicating the location on a 7-point scale where you picture yourself to be. If a pair of adjectives does not apply fill in a 4.

    Example: If you see yourself as being relatively relaxed, you might mark a 2 on the first item.

31. For each adjective pair (as in question 30) describe YOU AS YOU WOULD LIKE TO BE on the 7-point scale.

32. For each adjective pair (as in question 30) describe your perception of a TYPICAL BUSINESSMAN.

GO TO PAGE 3 OF YOUR ANSWER SHEET.

33. PERSONAL OPINION QUESTIONNAIRE III (Copyright 1962, Edgar H. Schein)

Below you will find a number of items dealing with various aspects of business management. Please indicate next to each item your degree of agreement or disagreement by writing the number 1, 2, 3, or 4.

1 means strong agreement

2 means mild agreement

3 means mild disagreement

4 means strong disagreement

Please try to be as frank as you can in giving your opinion. There are no right or wrong answers to any of the items. We are trying to find out how people feel about the issues which are described in the items.

If any item makes no sense to you at all, or you genuinely have no opinion about an issue, leave it blank. But please try to give answers to as many of the items as possible.

1. Governmentally operated projects cannot compete with private enterprise because they are less efficient.

2. Group decisions are generally more conservative than what the leader of the group would have done had he decided alone.

3. The man who gets ahead in industry is the man who has someone sponsoring him.

4. Most industrial problems can be attributed to a few basic causes.

5. Most workers in industry can be trusted enough to be allowed to set their own production goals.

6. Government should be headed by men trained in business techniques and sympathetic to the cause of business.

7. Most consumers' products manufactured today have been designed to last only a few years.

1 strong agreement
2 mild agreement
3 mild disagreement
4 strong disagreement

8. In industry there must always be unity of command so that individuals will not be subjected to conflicting authority.

9. The man who gets ahead in industry is the man who knows the right people.

10. Private enterprise working through a market economy provides the most equitable distribution of society's goods and services.

11. Proper advertising can sell virtually any product.

12. The best way to get ahead in business is to move from organization to organization.

13. Corporations have a definite obligation to take a stand on political issues.

14. The quality of individual decisions in generally higher than the quality of group decisions.

15. Resistance to change is industry's major problem.

16. The private life of an employee should be of no direct concern to his company.

17. The good manager must be willing to compromise his own ethics and morals to some degree in order to get his job done.

18. The most important objective of a company is to allow for the maximum development of its employees as individuals.

19. A corporation with a good public image can sell even an inferior product.

20. The average worker in industry is capable of exercising self-control.

21. The most important objective of a company is to provide its stockholders with as high a return on their investment as is possible.

22. Corporations have a definite obligation to support liberal arts colleges.

23. Most organizations would be more effective if they used committees to make some of their decisions.

1 strong agreement
2 mild agreement
3 mild disagreement
4 strong disagreement

24. The primary purpose of a training program for college graduates should be to indoctrinate them with the organization's basic philosophy, goals, and ways of doing things.

25. A small company is generally a more desirable employer than a large corporation because it offers greater opportunity for the individual to maximize his talents.

26. The good manager is willing to make decisions which will hurt others.

27. Corporations have a definite obligation to give money to charity.

28. Managers are not always sincere in their dealings with other people.

29. Nowadays it is more important for a manager to be loyal to his profession than to any given organization.

30. The engineer in industry should give his primary allegiance to the company he works for, not the engineering profession as such.

31. The best kind of emotional relationship between a superior and a subordinate is an open one in which each party feels it can "level" completely with the other.

32. Management will usually do what is best for its employees without outside influence from unions.

33. The one most important factor contributing to a manager's advancement is his ability to get along with people.

34. The human relations-group dynamics approach in industry tends to stifle the individuality of employees.

35. The average employee's standard of living would not be what it is today had it not been for the efforts of labor unions on his behalf.

36. A large corporation is generally a more desirable employer than a small company since it offers security, regular advancement, and a wider selection of jobs.

37. The good manager should disregard the feelings of others in making decisions.

1 strong agreement
2 mild agreement
3 mild disagreement
4 strong disagreement

38. Government competition with private enterprise is unfair and should be eliminated.

39. Piece work systems are bad for company morale since they force competition between fellow workers.

40. The good businessman is basically a cold, calculating kind of person.

41. Most corporations do not have clear objectives which can serve as guides to executive decisions.

42. Industry's basic idea is to drive you as hard as it can and give you as little as possible.

43. A young man entering industry should be careful in selecting a wife to make sure she will fit into his career plans.

44. The average worker in industry prefers to avoid responsibility, has little amibtion, and wants security above all.

45. Many employers think only of their profits and care little for their employees' welfare.

46. It is the tough, driving, impersonal man who really gets ahead in industry.

47. The "committee way of life" in an organization often results in a good bit of wasted time.

48. The successful manager is a "jack of all trades and master of none."

49. Piece work systems are good for company morale because they stimulate high productivity.

50. Constant change and innovation is basically a good thing for society and its institutions.

51. One of the major reasons for the existence of company pension plans is that they insure the loyalty of the older employees.

52. Responsibility should never exceed authority because the individual cannot be held responsible for what he does not control.

53. The legal system of this country is generally slanted against big business.

54. Nowadays when industry hires a new manager his whole family should be screened as an indication of his potential for advancement.

1 strong agreement
2 mild agreement
3 mild disagreement
4 strong disagreement

55. Management will usually do what is best for its employees without outside influence from the government.

56. Managers usually deal with people in a democratic manner.

57. A man who is willing to work hard in industry does not need a union to protect him.

58. The good manager should rely on explanation and persuasion rather than direct orders.

59. To succeed in business one must be able to take criticism without being hurt by it.

60. The private life of an employee is properly a matter of direct concern to his company, for the two can never be completely segregated.

61. Most managers are delightful people to know socially.

62. A firm separation between staff and line functions is essential to efficient company performance.

63. Group incentive plans are superior to piece work systems in stimulating high productivity.

64. Most large corporations are placing more stress on the "corporation loyalty" of the employee than on his individual growth.

65. The most important objective of a company is to manufacture and sell products which are useful to society.

66. Managers often have to treat people unfairly to get their job done.

67. The man who gets ahead in industry is the man who knows how to "play politics."

68. Individual decisions cannot be as consistently sound as group decisions.

69. A corporation must be responsible for the health and welfare of its employees and their immediate families.

1 strong agreement
2 mild agreement
3 mild disagreement
4 strong disagreement

70. The one most important factor contributing to a manager's advancement is his ability to place the welfare of the company above that of his friends and colleagues.

71. The good manager should always be sensitive to the feelings of his subordinates.

72. Management is primarily a process of understanding and adapting to economic forces.

73. The more a young executive moves from job to job within a company, the greater will be his chance for success.

74. Many managers are suspicious of their business associates.

75. In business decisions, the human factor is usually more important than the economic factor.

76. Some degree of cynicism is a valuable attribute in a manager.

77. There are many sound principles of business which should not be changed even if economic and technological conditions change.

78. A wife's social grace and attractiveness play a significant role in her husband's rate of advancement.

79. The welfare of society is best achieved if all businesses pursue profit to the best of their ability.

80. A large corporation tends to suppress individual creativity.

81. "Price fixing," contract rigging, and other similar activities by leading American business firms show that the Federal Government must take a more active role in the policing of private enterprise.

82. Corporations have a definite obligation to be actively involved in community affairs.

83. A clearcut hierarchy of authority and responsibility is the cornerstone of the business organization.

84. Leadership skills can be acquired by most people, regardless of their particular inborn traits or abilities.

1 strong agreement
2 mild agreement
3 mild disagreement
4 strong disagreement

85. Religious teachings cannot be strictly observed in the business setting.

86. Present tax laws tend to stifle capital expansion by business more than they encourage it.

87. The average worker in industry has an inherent dislike to work and will avoid it if he can.

88. The successful manager is the one who becomes an expert in his own particular functions.

89. Large corporations create more opportunities than small companies for the individual to maximize his talents.

90. Strikes are usually caused by union leaders rather than rank-and-file members.

91. Most managerial jobs require a person to compromise his ethics or morals to some degree.

92. Compulsory arbitration should be instituted in vital industries such as the steel industry, to insure our country against work stoppages which jeopardize national defense.

93. It is the responsibility of business to insure that customers do not get inferior porducts.

94. The best way to get ahead in management is to have maximum experience in one field like finance, production, or marketing.

PLEASE RETURN ANSWER SHEETS AND QUESTIONNAIRE BOOKLET

IDENTIFICATION INFORMATION

STUDENT NUMBER

THIS YEAR

1969
1970
1971

SEX M F

EXPECTED DATE OF GRADUATION

AGE

Class of 70
Class of 71
Class of 72
Class of 73
Class of 74
Class of 75
Class of 76
Class of 77
Class of 78

DO NOT USE

PART I. BACKGROUND INFORMATION

1. 1 2 3 4 5 6 7 8 9 10 11 12

2. 1 2 3 4 5 6 7

3. 1 2

4. 1 2 3 4 5 6 7 8 9 10 11 12

5. 1 2 3 4 5 6 7

6. 1 2 3 4 5 6

7. 1 2 3 4 5 6

8. 1 2 3 4 5 6 7 8 9

9. 1 2 3 4 5 6 7 8 9

10. 1 2 3 4 5

11. 1 2 3

12. 1 2 3 4 5

13. 1 2

PART II. EDUCATIONAL EXPECTATIONS

	14a.	15a.	16a.
	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7
b.	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7
c.	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7
d.	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7
e.	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7
f.	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7
g.	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7
h.	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7
i.	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7
j.	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7
k.	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7
l.	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7
m.	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7
n.	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7
o.	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7
p.	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7
q.	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7
r.	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7
s.	1 2 3 4 5 6 7	1 2 3 4 5 6 7	1 2 3 4 5 6 7
t.			1 2 3 4 5 6 7
u.			1 2 3 4 5 6 7

17. 1 2 3 4 5 6 7 8 9

1 2 3 4 5 6 7 8 9

Other

Undecided

18. 1 2 3

19. 1 2 3

20. 1 2 3 4 5 6 7 8 9

1 2 3 4 5 6 7 8 9

Other

Undecided

21a. 1 2 3 4 5 6 7

b. 1 2 3 4 5 6 7

c. 1 2 3 4 5 6 7

d. 1 2 3 4 5 6 7

e. 1 2 3 4 5 6 7

f. 1 2 3 4 5 6 7

g. 1 2 3 4 5 6 7

h. 1 2 3 4 5 6 7

i. 1 2 3 4 5 6 7

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Massachusetts Institute of Technology

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PART III. CAREER OBJECTIVES

22. 1 2 3 4 5 6 7

23. 1 2 3 4 5 6 7

24. 1 2 3

25. 1 2 3

26. 1 2 3 4 5 6

27. 1 2 3 4 5 6 7 8 9

28. 1 2 3 4 5 6

29a. 1 2 3 4 5 6 7

b. 1 2 3 4 5 6 7

c. 1 2 3 4 5 6 7

d. 1 2 3 4 5 6 7

e. 1 2 3 4 5 6 7

f. 1 2 3 4 5 6 7

g. 1 2 3 4 5 6 7

h. 1 2 3 4 5 6 7

i. 1 2 3 4 5 6 7

j. 1 2 3 4 5 6 7

k. 1 2 3 4 5 6 7

l. 1 2 3 4 5 6 7

m. 1 2 3 4 5 6 7

n. 1 2 3 4 5 6 7

o. 1 2 3 4 5 6 7

p. 1 2 3 4 5 6 7

q. 1 2 3 4 5 6 7

PART IV. SELF PERCEPTION

Please describe:	30. YOU AS YOU SEE YOURSELF		31. YOU AS YOU WOULD LIKE TO BE	32. A TYPICAL BUSINESSMAN
Relaxed	1 2 3 4 5 6 7	Anxious	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Competitive	1 2 3 4 5 6 7	Non-competitive	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Lacks confidence	1 2 3 4 5 6 7	Confident	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Not cynical	1 2 3 4 5 6 7	Cynical	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Efficient	1 2 3 4 5 6 7	Inefficient	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Inflexible	1 2 3 4 5 6 7	Flexible	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Guarded	1 2 3 4 5 6 7	Frank	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Unenthusiastic	1 2 3 4 5 6 7	Enthusiastic	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Soft	1 2 3 4 5 6 7	Hard	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Inhibited	1 2 3 4 5 6 7	Uninhibited	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Subjective	1 2 3 4 5 6 7	Objective	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Patient	1 2 3 4 5 6 7	Impatient	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Impersonal	1 2 3 4 5 6 7	Personal	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Idealistic	1 2 3 4 5 6 7	Realistic	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Insensitive	1 2 3 4 5 6 7	Sensitive	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Insincere	1 2 3 4 5 6 7	Sincere	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Awkward	1 2 3 4 5 6 7	Poised	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Cooperative	1 2 3 4 5 6 7	Uncooperative	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Cautious	1 2 3 4 5 6 7	Daring	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Easily influenced	1 2 3 4 5 6 7	Mind of own	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Feels inferior	1 2 3 4 5 6 7	Feels superior	1 2 3 4 5 6 7	1 2 3 4 5 6 7
Follows	1 2 3 4 5 6 7	Leads	1 2 3 4 5 6 7	1 2 3 4 5 6 7

UTILITY FORM 5876 OPTICAL SCANNING FORMS BY OPTICAL SCANNING CORPORATION

PART IV. SELF PERCEPTION CONTINUED

Please describe:	30. YOU AS YOU SEE YOURSELF								31. YOU AS YOU WOULD LIKE TO BE								32. A TYPICAL BUSINESSMAN							
Emotional	1	2	3	4	5	6	7	Unemotional	1	2	3	4	5	6	7		1	2	3	4	5	6	7	
Friendly	1	2	3	4	5	6	7	Unfriendly	1	2	3	4	5	6	7		1	2	3	4	5	6	7	
Humble	1	2	3	4	5	6	7	Proud	1	2	3	4	5	6	7		1	2	3	4	5	6	7	
Mature	1	2	3	4	5	6	7	Immature	1	2	3	4	5	6	7		1	2	3	4	5	6	7	
Unoriginal	1	2	3	4	5	6	7	Original	1	2	3	4	5	6	7		1	2	3	4	5	6	7	
Tolerant	1	2	3	4	5	6	7	Prejudiced	1	2	3	4	5	6	7		1	2	3	4	5	6	7	
Satisfied	1	2	3	4	5	6	7	Dissatisfied	1	2	3	4	5	6	7		1	2	3	4	5	6	7	
Tactful	1	2	3	4	5	6	7	Tactless	1	2	3	4	5	6	7		1	2	3	4	5	6	7	

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Alfred P. Sloan School of Management
Massachusetts Institute of Technology

33. PERSONAL OPINION QUESTIONNAIRE

1 = strong agreement
2 = mild agreement
3 = mild disagreement
4 = strong disagreement

1. 1 2 3 4	17. 1 2 3 4	33. 1 2 3 4	49. 1 2 3 4	65. 1 2 3 4	81. 1 2 3 4
2. 1 2 3 4	18. 1 2 3 4	34. 1 2 3 4	50. 1 2 3 4	66. 1 2 3 4	82. 1 2 3 4
3. 1 2 3 4	19. 1 2 3 4	35. 1 2 3 4	51. 1 2 3 4	67. 1 2 3 4	83. 1 2 3 4
4. 1 2 3 4	20. 1 2 3 4	36. 1 2 3 4	52. 1 2 3 4	68. 1 2 3 4	84. 1 2 3 4
5. 1 2 3 4	21. 1 2 3 4	37. 1 2 3 4	53. 1 2 3 4	69. 1 2 3 4	85. 1 2 3 4
6. 1 2 3 4	22. 1 2 3 4	38. 1 2 3 4	54. 1 2 3 4	70. 1 2 3 4	86. 1 2 3 4
7. 1 2 3 4	23. 1 2 3 4	39. 1 2 3 4	55. 1 2 3 4	71. 1 2 3 4	87. 1 2 3 4
8. 1 2 3 4	24. 1 2 3 4	40. 1 2 3 4	56. 1 2 3 4	72. 1 2 3 4	88. 1 2 3 4
9. 1 2 3 4	25. 1 2 3 4	41. 1 2 3 4	57. 1 2 3 4	73. 1 2 3 4	89. 1 2 3 4
10. 1 2 3 4	26. 1 2 3 4	42. 1 2 3 4	58. 1 2 3 4	74. 1 2 3 4	90. 1 2 3 4
11. 1 2 3 4	27. 1 2 3 4	43. 1 2 3 4	59. 1 2 3 4	75. 1 2 3 4	91. 1 2 3 4
12. 1 2 3 4	28. 1 2 3 4	44. 1 2 3 4	60. 1 2 3 4	76. 1 2 3 4	92. 1 2 3 4
13. 1 2 3 4	29. 1 2 3 4	45. 1 2 3 4	61. 1 2 3 4	77. 1 2 3 4	93. 1 2 3 4
14. 1 2 3 4	30. 1 2 3 4	46. 1 2 3 4	62. 1 2 3 4	78. 1 2 3 4	94. 1 2 3 4
15. 1 2 3 4	31. 1 2 3 4	47. 1 2 3 4	63. 1 2 3 4	79. 1 2 3 4	
16. 1 2 3 4	32. 1 2 3 4	48. 1 2 3 4	64. 1 2 3 4	80. 1 2 3 4	

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Bibliography

Bibliography

"The Alfred P. Sloan School of Management Report of the Dean." Cambridge, Mass., 1968-69, 1969-70, and 1970-71.

Alkin, Marvin C. "Towards an Evaluation Model; A Systems Approach." CSEIP Working Paper No. 4. University of California: Los Angeles, December, 1967.

Allport, Gordon W., Philip E. Vernon, and Gardner Lindzey. Study of Values, A Scale for Measuring the Dominant Interests in Personality. Houghton Mifflin: Boston, Mass., 1960.

Amstutz, Arnold E. "Shaping the Management Environment - First Step in Designing Management Decision Systems." Computer Operations, Vol. III, No. 2. March/April, 1969, pp. 44-50.

Anderson, T. W. An Introduction to Multivariate Statistical Analysis. Wiley: New York, 1958.

Andrews, F., V. N. Morgan, and V. A. Sonquist. Multiple Classification Analysis. University of Michigan: Ann Arbor, 1967.

Armitage, Peter, Cyril Smith, and Paul Alper. Decision Models for Educational Planning. Allen Lane, The Penguin Press: London, 1969.

Astin, Alexander W. "Personal and Environmental Determinants of Student Activism." Address to American Psychological Association: Santa Monica, California, August 30, 1968.

Astin, Alexander W. The College Environment. The American Council on Education: Washington, D.C., 1968.

Astin, Alexander W., and Robert J. Panos. The Educational and Vocational Development of College Students. American Council on Education: Washington, D.C., 1969.

ATGSB Statistical Summary by Undergraduate Colleges Attended. Educational Testing Service: Princeton, 1957-1970.

Atkinson, John, ed. Motives in Fantasy Action and Society. D. Van Nostrand Co: Princeton, 1958.

Baker, F. B. "The Internal Organization of Computer Models of Cognitive Behavior." Behavioral Science, Vol. 12, 1967, pp. 156-161.

Barzun, Jacques. The American University - How It Runs and Where It Is Going. Harper: New York, 1968.

Beecher, Howard S, Blanche Geer, and Everett C. Hughes. Making the Grade, The Academic Side of College Life. Wiley: New York, 1968.

Bennis, Warren G. Changing Organizations. McGraw Hill: New York, 1966.

Berson, John. "Instructional Systems Development: A Demonstration and Evaluation Project." Michigan State University, July, 1967.

Black, Hillel. They Shall Not Pass. William Morrow and Co.: New York, 1963.

Blalock, Hubert M. and Ann B. Blalock, eds. Methodology in Social Research. McGraw Hill: New York, 1968.

Brown, G. J. and R. C. Atkinson. "Models for Optimizing the Learning Process." Technical Report No. 92, Institute for Mathematical Studies in the Social Sciences, Stanford University: Stanford, 1966.

Bruner, Jerome S. The Process of Education. Harvard University Press: Cambridge, 1963.

Buchwald, Art. Son of the Great Society. G. P. Putnam's Sons: New York, 1965.

Buell, Lawrence. "Looking Ahead in Admissions: The Alumni Representative Program." Oberlin Alumni Magazine, Oberlin, Ohio, July/August, 1972.

Buros, Oscar K., ed. The Mental Measurements Yearbook. Gryphon Press: Highland Park, New Jersey, 6th edition, 1965.

Buros, Oscar K., ed. Tests in Print. Gryphon Press: Highland Park, New Jersey, 1961.

Business Week. "M.I.T. Aims to Grow a New Rt. 128." July 22, 1972.

Campbell, D. T. and D. W. Fiske. "Convergent and Discriminant Validation by Multitrait-Multimethod Matrix." Psychological Bulletin, Vol. 56, No. 2, 1969, pp. 81-105.

Cartter, Allan M. "Scientific Manpower for 1970-1985." Science, April 9, 1971.

Caws, Peter J. "Design for a University." Daedalus, Winter, 1970, pp. 84-107.

Cochran, William L. Sampling Techniques. 2nd edition, Wiley and Sons: New York, 1963.

Cook, Desmond L. "Program Evaluation and Review Techniques, Applications in Education." Cooperative Research Monograph No. 17, U. S. Department of Health, Education and Welfare: Washington, D. C., 1966.

Cooley, W. W. and P. R. Lohnes. Multivariate Procedures for the Behavioral Sciences. Wiley and Sons: New York, 1962.

Cooley, W. W. and P. R. Lohnes. "Techniques for Considering Multiple Measurements." From R. L. Thorndike, Educational Measurement, 2nd Edition. American Council on Education: Washington, D.C., 1971, pp. 601-622.

Cornford, F. M. Microcosmographia Academia Being a Guide for the Young Academic Politician - 1908. Reprinted by the Massachusetts Institute of Technology Education Research Center: Cambridge, Mass., 1972.

DuBois, Philip H. A History of Psychological Testing. Allyn and Bacon: Boston, 1970.

Dungan, Ralph A. "Higher Education: The Effort to Adjust." Daedalus, Winter, 1970, pp. 141-153.

Eble, Kenneth E. The Recognition and Evaluation of Teaching. American Association of University Professors and the Association of American Colleges: Washington, D. C., 1971.

Elhag, Ali M. "The System Approach to Curriculum Planning With an Application to Collegiate Business Programs." Midwestern University School of Business: Wichita Falls, Texas, 1970.

Farrar, D. E. and R. R. Glauber. "Multicollinearity in Regression Analysis: The Problem Revisited." The Review of Economics and Statistics, Vol. 49, No. 1, 1967, pp. 92-107.

Ferber, Robert. Market Research. McGraw Hill: New York, 1949.

Fine, Benjamin. Barron's Profiles of American Colleges. 1971-72 edition, Barron's Educational Series: Woodbury, New York, 1971.

Folger, John K., Helen S. Astin and Alan E. Bayer. "Human Resources and Higher Education, Staff Report of the Commission on Human Resources and Advanced Education." Russell Sage Foundation: New York, 1970.

Friedman, H. and J. Rubin. "Some Invariant Criteria for Grouping Data." Journal of American Statistical Association, 1967.

Friedman, H. and J. Rubin. A Cluster Analysis and Taxonomy System for Grouping and Classifying Data. IBM Corporation: New York, 1967.

Garrett, Henry E. Statistics in Psychology and Education. McKay: New York, 1966.

Glaser, R. "Evaluation of Instruction and Changing Educational Models." Proceedings of the Symposium on Problems in the Evaluation of Instruction, University of California: Los Angeles, December, 1967.

Glaser, R. and A. J. Nitko. "Measurement in Learning and Instruction." From R. T. Thorndike, ed. Educational Measurement, 2nd edition.

American Council on Education: Washington, D.C., 1971, pp. 625-670.

Gonzalez, S. M., D. A. Kaled, and J. P. Russo. "The Business School Image." MBA, October, 1967, pp. 30-32.

Gordon, Paul S. "Administrative Strategy in a Graduate School of Administration." Academy of Management Journal, December, 1967, pp. 360-362.

Goslin, David A. The Search for Ability, Standardized Testing in Social Perspective. Russell Sage Foundation: New York, 1963.

Graduate Business Admissions Council. Programs of Graduate Study in Business. Educational Testing Service: Princeton, 1969-1970.

Graduate Business Admissions Council. "The Beliefs and Attitudes of Male College Seniors, Freshmen and Alumni." A study by Roper Research Associates for the Standard Oil Company: New Jersey, May, 1969.

Graubard, Stephen R. "Preface." Daedalus, Winter, 1970, pp. v-xvi.

Green, Ben A. "Physics Teaching By the Keller Plan at M.I.T." American Journal of Physics, Vol. 37, No. 7, July, 1971, pp. 764-775.

Green, G. J. and R. C. Atkinson. "Models for Optimizing the Learning Process." Technical Report #92, Institute for Mathematical Studies in the Social Sciences: Stanford University, 1966.

Green, P. E. and D. S. Tull. Research for Marketing Decisions. Prentice Hall: Englewood Cliffs, New Jersey, 1970.

Guilford, Joy Paul. Nature of Human Intelligence. McGraw Hill: New York, 1967.

Halfman, Robert L., M. L. A. MacVicar, W. T. Martin, Edwin F. Taylor, and Jerrold R. Zacharias. "Tactics for Change, Checklists for the Academic Innovator - 1972." Massachusetts Institute of Technology Education Research Center: Cambridge, Mass., 1972.

Hall, Douglas T. "The Effect of Teacher-Student Congruence Upon Student Learning." Paper delivered at the meeting of the American Educational Research Association: Chicago, February 10, 1968.

Harmon, H. Modern Factor Analysis. University of Chicago Press: Chicago, 1967.

Harrell, Thomas W. "The Personality of High Earning MBA's in Small Business." Personal Psychology, Vol. 23, 1970, pp. 369-375.

Harris, C. W. "Some Rao-Guttman Relationships." Psychometrica, Vol. 27, 1962, pp. 247-263.

Hartley, Harry J. Educational Planning - Programming - Budgeting: A Systems Approach. Prentice Hall: Englewood Cliffs, New Jersey, 1968.

Hawrylyshyn, B. "Preparing Managers for International Operations, Role of Management Development Institutes." International Management Development Institute: Geneva, March, 1968.

Hays, William. Statistics for Psychologists. Holt: New York, 1963.

Hays, William and Robert L. Winkler. Statistics - Volume I. Holt, Rinehart and Winston: New York, 1970.

Hodgkinson, Harold L. Institutions in Transition, A Study of Change in Higher Education. McGraw Hill: New York, 1971.

Hoffmann, Banesh. The Tyranny of Testing. Crowell-Collier Press: New York, 1962.

Jackson, D. N. "Multimethod Factor Analysis in the Evaluation of Convergent and Discriminant Validity." Psychological Bulletin, 1969, pp. 30-49.

Jackson, D. and I. Kusyszyn. "A Multimethod Factor Analytic Appraisal of Endorsement and Judgement Methods in Personality Assessment." Educational and Psychological Measurement, Vol. 28, No. 4, 1968, pp. 1047-61.

Johnston, J. Econometric Methods. McGraw Hill: New York, 1960.

Kaiser, H. F. and J. Caffrey. "Alpha Factor Analysis." Psychometrica, Vol. 30, 1965, pp. 1-14.

Kendall, M. G. A Course in Multivariate Analysis. Charles Griffin and Co.: London, 1957.

The Key Reporter Phi Beta Kappa. "Pass/Fail Study Committee Reports Findings." Vol. 35, No. 2, Winter 1969-70, pp. 2-4.

Kish, Leslie. Survey Sampling. Wiley and Sons: New York, 1965.

Lawley, D. and A. Maxwell. Factor Analysis as a Statistical Method. Butterworths: London, 1963.

Lean, Arthur E. And Merely Teach, Irreverent Essays on the Mythology of Education. Illinois University Press: Carbondale, Illinois, 1968.

Lipset, Seymour M. and Everett C. Ladd, Jr. "The Divided Professoriate." Change, Vol. 3, No. 3, May/June, 1971.

Lohnes, P. R. "Text Space and Discriminant Space Classification Models and Related Significance Tests." Educational and Psychological Measurement, Vol. 21, 1961, pp. 559-574.

Lumsden, Keith G. "Where We Stand Now." Journal of Economic Education, Vol. 1, No. 1, Fall, 1969, p. 14.

Mann, William and Daniel Fusfeld. "Attitude Sophistication and Effective Teaching in Economics." Journal of Economic Education, Vol. 1 and 2, Spring, 1970.

McMillan, Claude and Richard Gonzalez. Systems Analysis, A Computer Approach to Decision Models. Richard D. Irwin: Homewood, Illinois, 1968.

Molenda, Michael H. "Instructional Systems Development." Center for Instructional Communications, Syracuse University: Syracuse, March, 1968.

Monk, James A. Jr. "A Feasibility Study of a Proposed Admissions Program for the Alfred P. Sloan School of Management." Master's Thesis, M.I.T.: Cambridge, June, 1971.

Montgomery, David B. and Alvin J. Silk. "Clusters of Consumer Interests and Spheres of Influence of Opinion Leaders." Journal of Marketing Research, Vol. VIII, August, 1971, pp. 317-321.

Morrison, D. G. "On the Interpretation of Discriminant Analysis." Journal of Marketing Research, Vol. 6, No. 2, 1969, pp. 156-165.

Newcomb, Theodore M. and Kenneth A. Feldman. The Impacts of Colleges on Their Students. Carnegie Commission for the Advancement of Teaching, January, 1968.

Nie, Norman H., Dale H. Bent and C. Hadler Hull. Statistical Package for the Social Sciences. New York: McGraw Hill, 1970.

Novick, David, ed. Program Budgeting, Program Analysis and the Federal Budget. 2nd Edition. Holt, Rinehart and Winston: New York, 1969.

Osgood, Charles E., George J. Suci, and Percy H. Tannenbaum. The Measurement of Meaning. University of Illinois Press: Urbana, Illinois, 1957.

O'Toole, J. F. Jr. "Systems Analysis and Decision Making in Education." Systems Development Corporation: Santa Monica, California, 1965.

Peterson, Richard E. and John A. Bilorusky. May 1970: The Campus Aftermath of Cambodia and Kent State. A Technical Report sponsored by the Carnegie Commission on Higher Education: Berkeley, California, 1971.

Pierson, Frank C. et al. The Education of American Businessmen, A Study of University-College Programs in Business Administration. McGraw Hill: New York, 1959.

Plimpton, Francis T. "The Police Must Be Called If Other Legal Measures Fail." The New York Times, May 4, 1969.

Pool, Ithiel de Sola, ed. Trends in Content Analysis. University of Illinois Press: Urbana, Illinois, 1959.

Prothro, E. Terry and J. O. Keehu. "Stereotypes in Semantic Space." In Snider and Osgood, Semantic Differential Technique. Aldine: Chicago, 1969, pp. 441-453.

Rao, C. R. Advanced Statistical Methods in Biometric Research. Wiley and Sons: New York, 1952.

Reisman, Arnold and Martin I. Taft. "A Systems Approach to the Evaluation and Budgeting of Educational Programs." Socio-Economic Planning Science, Vol. 3, Permagon Press: Great Britain, 1969.

Riesing, Thomas F. "Managerial Conceptual Structure and Managerial Performance." Unpublished doctoral dissertation, Massachusetts Institute of Technology: Cambridge, Mass., February, 1972.

Riesman, D. and C. Jencks. The Academic Revolution. Doubleday: Garden City, New York, 1968.

Rubin, Irwin, Dave Kolb, James McIntyre and George Farris. "The Process of Joining Up Individuals and Organizations." Educational Opportunity Forum: University of the State of New York, Albany, Vol. 1, No. 4, Fall, 1969.

Rockart, John. "An Integrated Use of Available Resources (Student, Professor and Technology) In the Learning Process." Working Paper No. 601-72, Sloan School of Management: Cambridge, Mass., 1972.

Rourke, Francis E. and Glenn E. Brooks. The Managerial Revolution in Higher Education. The Johns Hopkins Press: Baltimore, 1966.

Rummel, R. J. Applied Factor Analysis. Northwestern University: Evanston, Illinois, 1970.

Schein, Edgar H. "Attitude Change During Management Education." Administrative Science Quarterly, Vol. 2, No. 4, March, 1969, pp. 601-628.

Schein, Edgar and D. T. Hall. "The Student Image of the Teacher." Working Paper No. 231-66, M.I.T.: Cambridge, Mass., December, 1966.

Schneider, Benjamin. "Some Differences Between Students About to Study Industrial Organization Psychology in Psychology and Non-Psychology Department." Paper presented as a contribution to a symposium, "The Changing Role of Industrial Psychology in University Education," American Psychological Association Annual Convention: Washington, D. C., August 31, 1969.

Smith, Roger G. Jr. "The Design of Instructional Systems." George Washington University Technical Report 66-18: Washington, D. C., 1966.

Snedecor, George W. and William G. Cochran. Statistical Methods. 6th Edition. Iowa State University Press: Ames, Iowa, 1967.

Snider, James G. ed and Charles E. Osgood. Semantic Differential Technique. Aldine: Chicago, Illinois, 1969.

Sondquist, J. A. and J. N. Morgan. "The Detection of Interaction Effects." Monograph No. 35, Survey Research Center, University of Michigan, Cushing Malloy: Ann Arbor, Michigan, 1964.

Stephenson, William. The Study of Behavior. University of Chicago Press: Chicago, 1953.

Thorndike, Robert L. and Elizabeth Hagen. Measurement and Evaluation in Psychology and Education. John Wiley and Sons, Inc.: New York, 1969.

Toffler, Alvin. Future Shock. Random House, 1970.

Trow, Martin. "Reflections on the Transition from Mass to Universal Higher Education." Daedalus, Winter, 1970, pp. 1-42.

Tryon, Robert C. and Daniel E. Bailey. Cluster Analysis. McGraw Hill: New York, 1970.

U.S. News and World Report. "As Turmoil Spreads -- Uneasy U.S. Takes Stock." May 19, 1969.

U.S. News and World Report. "New Mood of College Students, Results of a National Survey." June 19, 1972, pp. 28-35.

Vernon, P. E. Intelligence and Attainment Tests. University of London Press: London, 1960.

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